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THE

MILITARY SCHOOLS

OF

EUROPE

AND OTHER PAPERS SELECTED FOR PUBLICATION.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1896.

War Department (Military Information Division)

DOCUMENT No. 10.

OFFICE OF THE ADJUTANT GENERAL.

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ERRATA.

In Table of Contents, line 21, for *13* read 8.

In Table of Contents, line 22, omit *one of them making a separate plate.*

INTRODUCTORY NOTE.

The papers contained in this volume are deemed to be of sufficient military interest to warrant their publication and distribution to the Army. The article on foreign military schools was prepared in the Military Information Division for the use of the Board of Visitors, United States Military Academy, and was published in the Report of the Board for the year 1895. As the proof of this part of the report was not read in the Military Information Division the article as published contains a number of errors and misprints. It has, therefore, been decided to revise and correct the article, and to republish it in a shape more accessible to officers of the Army generally.

With the exception of a few reprints, the other papers of this number consist of articles prepared in, or submitted to, the Military Information Division. The paper on "Laying ahead," by First Lieut. H. C. Davis, Third Artillery, was read as a lyceum essay during the season of 1895–96, and recommended for publication under General Orders No. 58, 1895.

WASHINGTON, *May 1, 1896.*

Conditions of Admission and Courses of Instruction in the National Military Schools of European Powers.

PREPARED IN THE MILITARY INFORMATION DIVISION FOR THE BOARD OF VISITORS, UNITED STATES MILITARY ACADEMY, AND PRINTED IN THEIR LAST REPORT.—REVISED AND CORRECTED.

BELGIUM.

The school which corresponds most nearly to the United States Military Academy is the École Militaire, or Military Academy, at Ixelles.

The object of this school is to supply officers to the following arms: (1) The infantry, (2) the cavalry, (3) the artillery, and (4) the engineers.

The length of the course of instruction is two years for the infantry and cavalry section, and four years for the artillery and engineer section.

All students, on commencing the second year's course, must contract to serve for eight years.

There are no admissions to the school except by competition.

The number of places or vacancies at the school is announced every year about the middle of February.

In 1895 the total number of places to be competed for was 85. In 1894 the total number of vacancies announced was 70.

CONDITIONS OF THE COMPETITIONS.

I. The names of all candidates must be entered on the lists of the Military Academy.

These lists are closed one month before the opening of the examinations. No one can be admitted to the competition unless he has previously shown: (1) That he is a native or naturalized Belgian; (2) that he is over 17 and less than 21 years of age on the day of the opening of the competition.

Youths of less than 18, who under the laws in force in Belgium have at this age the right of choosing Belgian nationality, may also be admitted to the competition. They will not, however, be allowed to commence the second year's course unless they have made their declaration of election according to the forms prescribed by the law.

Exceptionally, the following may be admitted to the competitions: (1) Soldiers of the active army, up to the age of 25 years; (2) university graduates who have obtained one or more academic degrees, up to the age of 23 years.

II. Each candidate, on entering his name on the list at the Military Academy, must furnish:

(*a*) A copy of his certificate of birth.

(*b*) A copy of his father's certificate of birth.

The documents must be attested in proper form by the president of the tribunal of first instance.

(*c*) A declaration of the father or guardian of the candidate, certifying that the father of the latter was born of Belgian parents, or that he has obtained full naturalization by the law of ———.

This declaration must be legalized by the burgomaster of the place where the affiant is domiciled.

If the father of the candidate had acquired the status of Belgian nationality by fulfillment of the formalities prescribed in article 9 of the Civil Code, the person so admitted to citizenship must produce the attestation of competent authority to that effect.

* * * * * * * * *

(*d*) Candidates who are not from the army and who are more than 19 years of age on the 1st of January of the year of the examinations must produce a certificate stating that they have taken part in a drawing of lots for the militia.

Candidates must besides, at the time of entering their names, declare: (1) The language (French or Flemish) with which they wish to prove that they are thoroughly familiar, from a grammatical and literary standpoint; (2) the language (Latin, Flemish, French, German, or English, other than that chosen for 1) on which they wish to be questioned.

When they present themselves for the oral examinations, candidates must deliver to the president of the examining board: (1) A certificate of vaccination signed by a physician and legalized by the communal authority; (2) a certificate of the communal administration of the place of the domicile testifying to their good conduct.

III. The examinations for admission are held annually before an examining board appointed by the King. These examinations are both oral and written.

Separate competitions are held (*a*) for artillery and engineers, (*b*) for the infantry and cavalry. Candidates may have their names entered for both competitions, or for each of them separately.

There are for each competition two series of examinations: The first series is the same for both sections; it hinges upon (*a*) a thorough acquaintance with French or Flemish; (*b*) Latin, Flemish, French, German, or English; (*c*) history; (*d*) geography, and (*e*) drawing.

The different examinations of this series are either oral or written, and extend over several sessions.

The second series deals with the mathematical branches; it is distinct for the two sections.

The examinations for the first series commence on the 30th of July.

The examinations in mathematics are held as follows: (*a*) For the artillery and engineer section, toward the 1st of September, and (*b*) for the infantry and cavalry section toward the 1st of October, after the admissions to the first of the sections mentioned have been decided upon.

The examinations to be undergone for the artillery and engineer section can not secure for a candidate a place on the list of admissions to the infantry and cavalry section.

IV. For the different branches the following number of points will be allotted:

(*a*) For admission to the infantry and cavalry section:

	Points out of 100.
Mathematics—	
Written examination	17
Oral examination	16
Thorough acquaintance with the French or Flemish language	25
History	12
Geography	12
Latin, Flemish, German, or English	15
Drawing	3
Total	100

(*b*) For admission to the artillery and engineer section:

Mathematics—	
Written examination	25
Oral examination	25
Thorough acquaintance with the French or Flemish language	20
History	9
Geography	9
Latin, Flemish, French, German, or English	9
Drawing	3
Total	100

Every candidate who in the first series of examinations does not obtain in the examination to test the thorough acquaintance with the French or Flemish language one-half the maximum number of points assigned to this branch, or in any of the other branches (except drawing) two-fifths of the maximum, will be excluded from the competition and will not be admitted to the examinations of the second series.

No candidate can be included in the final classification list, whatever be his general average, who does not obtain one-half of the maximum number of points assigned to all the mathematical branches if he is competing for the artillery and engineer section, and two-fifths of this number if he presents himself for the infantry and cavalry section.

Before being admitted to take part in the competitions, the candidates are examined by a medical board, to determine whether they are fit for the military service.

V. PROGRAMME OF THE ATTAINMENTS REQUIRED.

A.—Thorough Acquaintance with the French or Flemish Language.

The programme of this examination is that of the Latin or modern classical courses of the Royal Athénées (high schools) up to and including rhetoric.

Special stress is laid upon the following parts:

Style.—Principles, figures, and tropes.

Fundamental principles of the narrative and descriptive style, of the epic, of the dramatic style, and of eloquence.

Literary analysis of an address, of a piece of prose or poetry.

Composition.—Narration, description, letter, address.

B.—Latin, Flemish, French, German, or English.

Latin.—The candidates will execute a theme and a translation (the translation without dictionary). They should be able to translate at sight one of the classic authors studied in the second-class year[1] or in rhetoric.

Flemish, German, and English.—The examination will include a theme and a translation (without a dictionary). The candidates must, besides, be able to explain at sight a prose selection, and reply, in the language that they offer, to a few questions that will be put to them in that tongue.

French.—The candidates who have undergone the searching examination in Flemish will have an exercise in grammatical analysis and an exercise in composition.

C.—History.

The subjects taught in the royal high schools up to and including rhetoric. Stress will be laid on the subjects detailed below.

General history.—The questions cover ancient history as far back as the reign of Alexander the Great, mediæval history, and modern history of the principal European and American nations down to the Russo-Turkish war of 1877-78.

History of Belgium.—The questions cover the whole subject of the history of the Netherlands from the time of Julius Cæsar down to the separation of Belgium from Holland in 1830, and include the events which immediately followed this revolution, down to the revision of the Belgian Constitution (7th September, 1893).

D.—Geography.

The subjects taught in the royal high schools up to and including the rhetorical course.

Stress will be laid upon acquaintance with the following subjects:

Principles of cosmography and of general geography.—Form and dimensions of the earth; diurnal revolution of the earth; terrestrial circles; zones; astronomical seasons; inequalities in the lengths

[1] Of the Athénées Royales.

of the days and nights; lunations; mean radii of the ecliptic and of the moon's orbit; longitudes; latitudes; division of the globe between continents and oceans; cartographical figure and division of the continents; principal divisions of the oceans, straits, and lakes.

Physical, political, and statistical geography of Europe.—Comprises a very thorough examination on this subject, with particular reference to the geography of Germany, France, the Netherlands, and Austria-Hungary.

General geography.—Asia, America, Africa, and Oceanica; boundaries; principal coasts, seas, islands, gulfs, etc.; nomenclature, situation, and development of the great mountain chains; principal rivers; population; political divisions and important cities.

Geography of Belgium, physical, political, and administrative.—Comprises a very searching examination, descending to small details. Among the problems is to draw a somewhat detailed map of each of the Belgian provinces, with scale, etc.

E.—Drawing.

Candidates will have to draw from nature, and will also shade, a few objects of simple form, approximating in shape to the polyhedrons of solid geometry.

SUBJECTS OF THE SECOND SERIES OF EXAMINATIONS.

F.—Mathematics.

(*a*) Artillery and Engineering.

Programme of the scientific section of the royal high schools, up to and including the rhetorical course.

(*b*) Infantry and Cavalry.

Programme of the section of the Latin classical course of the royal high schools up to and including rhetoric, besides the part that treats of surfaces and of the volumes of round bodies.

The programme gives very fully the subjects of the examination, in which the parts that pertain only to the artillery and engineer examination are given in italics. As this programme is extremely long, the subjects will be mentioned only in a general way, and the matters peculiar to the artillery and engineer examination will be indicated in italics.

ARITHMETIC.

Notation and numeration; the four fundamental rules; common fractions.

Decimal fractions, and the metric system.

Operations with complex numbers; proportion; simple interest; discount; partnership; alligation.

Theory of the divisibility of numbers, etc.

Resolution of numbers into their prime factors, etc. Theory of the greatest common divisor and least common multiple.

Cube root of numbers.

Theory of prime numbers; Fermat's theorem.

Different systems of numeration; fundamental operations on whole numbers in any system whatever; character of divisibility by a divisor of $B^n \pm r$.

Numerical approximations; abridged methods for multiplying and dividing and extracting the square root.

Various applications.

ALGEBRA.

Through equations of the second degree.

Equations reducible to the second degree; reduction of expressions of the form $\sqrt{a+\sqrt{b}}$.

Reduction of expressions of the form $\sqrt{a+b\sqrt{-1}}$.

Properties of trinomials of the second degree, etc.

Progressions; theory of logarithms by progressions; use of tables; applications to questions of compound interest and annuities.

Indeterminate coefficients.

Maximum of the product $x^m y^n$, when $ax+by$ is constant. Maximum or minimum of a function of the second degree with two variables.

Continued fractions.

Indeterminate analysis of the first degree.

Theory of arrangements, permutations and combinations; binomial theorem; powers of a polynomial; extraction of roots of numbers and polynomials; summations of the like powers of the terms of an arithmetical progression.

Powers and roots of monomials higher than those of the second degree. Fractional or negative exponents; exponential equations.

Theory of logarithms by the exponential equation; concordance of the two definitions; modulus; Naperian logarithms.

Elementary theory of determinants of two and three lines.

Various applications.

PLANE GEOMETRY.

Through the Euclidian or elementary geometry.

Elements of the theory of transversals.

Harmonic and anharmonic divisions and pencils.

Poles and polars; theorems of Pascal and Brianchon for the circle.

Mensuration; leveling; plane surveying with the square, graduated circle, and plane table.

Various applications.

SOLID GEOMETRY.

Through the subject.

Theories of similitude and symmetry; planes, axes, and centers of symmetry.

Spherical triangles.

Regular polyhedrons.

TRIGONOMETRY.

Through plane trigonometry.

Construction and use of trigonometrical tables.

Solution of triangles, including the use of logarithmic tables, etc.

Through spherical trigonometry, including the mensuration of the volumes of the parallelopipedon and the tetrahedron in functions of the angles, etc.

ANALYTICAL GEOMETRY.

Through analytical geometry of two dimensions.

DESCRIPTIVE GEOMETRY.

First principles; theorems and problems relating to the point, right line, and plane.

Candidates will have to solve graphically a problem, and submit accurate drawings of the same.

* * * * * * * * *

The works specially recommended (being those submitted to the Government by the council for the advancement of education in the middle schools for the teaching of the scientific course of the first class year in the high schools of the Kingdom) are the following:

Arithmetic.—Gelin: Traité d'arithmétique élémentaire, à l'usage des élèves des cours professionnels, des candidats aux écoles spéciales des universités, et à l'École militaire de Bruxelles. Bertrand: Traité d'arithmétique.

Algebra.—Falisse et Graindorge: Traité d'algèbre élémentaire. Bertrand: Traité d'algèbre.

Geometry.—Cambier: Éléments de géométrie, d'après A. M. Legendre. Blanchet: Éléments de géométrie, par A. M. Legendre; avec additions et modifications.

Trigonometry.—Cambier: Leçons de trigonométrie rectiligne et sphérique. Gelin: Éléments de trigonométrie plane et sphérique, à l'usage des cours professionnels, des candidats aux écoles spéciales des universités et à l'École militaire de Bruxelles.

Analytical geometry.—Falisse: Cours de géométrie analytique plane. Briot et Bouquet: Leçons de géométrie analytique.

Descriptive geometry.—No work is specially recommended, but among the seven works authorized the one which gives the best preparation for the present course of instruction at the military academy is the following: Chome: Cours de géométrie descriptive de l'École militaire, 1re partie, livre 1, seconde édition.

Determinants.—Mansion: Introduction à la théorie des déterminants (seconde édition).

ADMISSION OF CANDIDATES.

VI. The minister of war decides upon the persons who are to be admitted to the military academy, in accordance with the results of the competitions.

* * * * * * * * *

Every candidate admitted as a scholar who does not report within four days after the date fixed for the opening of the course of studies * * * is considered as having resigned.

On their arrival at the school the scholars are subjected to a medical examination. * * *

VII. Relates to the sums to be paid for maintenance and outfit.[1] Scholars admitted from the ranks receive the pay and allowances of their former grade while present at the academy.

VIII. Relates to scholarships and half scholarships, which are granted principally to those whose parents are unable to pay for their education. These aids are, as a rule, only granted during the first year of the course, except when a scholar greatly distinguishes himself, when the same aid may be granted for the second year.

REMARKS.

In the examination of 1893 there were 384 candidates for 60 vacancies.

After finishing two years of the course the scholars of the infantry and cavalry section who pass the final examinations successfully are commissioned second lieutenants. The scholars of the artillery and engineer section who pass at the end of the second year are also commissioned second lieutenants, but they remain at the academy for two years longer to finish the remainder of their course. They are called "Élèves sous-lieutenants," (student second lieutenants).

There is a preparatory school called the "Cours central de préparation à l'École militaire," the object of which is to prepare noncommissioned officers of the army for the competitive examination to enter the military academy. About 20 noncommissioned officers are admitted to the course by a competitive examination.

Any noncommissioned officer who fulfills the required conditions of age and length of service, and who is recommended by an examining board of the regiment, may present his application to his commanding officer, who, if he considers the applicant to be worthy of a commission, will forward the application through the regular military channels to the minister of war, with the necessary legal papers in each case.

The course is for one year, and no person is allowed to remain more than this length of time at the school.

The subjects of examination for those who wish to compete for the "cours central" correspond to the programme taught in the second year of the night-school course for noncommissioned officers of infantry and cavalry, omitting the elements of the natural sciences.

These branches are as follows:

French or Flemish language.—Reading, writing, and grammar.

Arithmetic.—Through extraction of the square root.

Algebra.—Through solution of equations of the first degree, with one or more unknown quantities.

History.—Belgium: History of Belgium from the House of Burgundy to the present time. General: From the peace of Westphalia to the present time.

Geography and cosmography.—Particular attention is to be paid to the geography of Belgium, a less particular study of the geography of the other European states, and an outline of the geography of the rest of the world.

Writing.—Principles of writing. (Instruction in writing is begun in the first and finished in the second year.)

Drawing.—Up to and including the drawing of the simple geometrical figures, plane and solid.

Physics and chemistry.—A few elementary ideas on these subjects.

ÉCOLE MILITAIRE DE BELGIQUE.—PROGRAMME OF THE COURSE OF INSTRUCTION.

Artillery and engineer section.

FIRST YEAR.

Higher algebra (22 lessons): Commencing with the theory of determinants, through the solution of equations of the fourth degree and the subject of imaginary quantities.

Analytical geometry (16 lessons): Through equations of surfaces of the second order.

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[1] The annual charge for "pension," or board, is 800 francs; the amount collected for the cost of outfit is about 875 francs, and a further charge of 250 francs is made for office and other expenses. These sums are paid by the parents or relatives of the scholars.

Differential calculus (28 lessons): Commencing with fundamental principles, through the study of plane curves with both rectilinear and polar coordinates, and the study of curves and surfaces of double curvature.

Descriptive geometry (70 lessons): Commencing with fundamental principles, through the subject of shades and shadows, etc. Commencement of the subject of perspective.

Cinematics (14 lessons): Motions of points and solid bodies.

Physics (40 lessons): Commencing with fundamental principles, through thermodynamics and acoustics.

Chemistry (40 lessons): Through the study of metals and their principle combinations.

French literature (25 lessons): History of literature up to the eighteenth century. Compositions.

Flemish (35 lessons): There is a superior course for pupils already acquainted with the language and a lower course for the other pupils.

German or English (35 lessons): Fundamental principles of the language. Practical exercises in conversation. Themes and translations.

Hippology (16 lessons): Elements of, and elements of veterinary hygiene.

Drawing: Drawing of the figure (25 lessons). Pen and ink (geometrical solids), (15 lessons).

Military regulations (40 lessons): Interior service. School of the soldier. School of the company. Firing regulations.

Exercises: Military exercises and drills. Gymnastics. Fencing. Riding. Swimming.

SECOND YEAR.

Integral calculus (37 lessons): Through the subject.

Theory of probabilities: Through the subject, including the method of least squares, and applications to questions arising in firing.

Descriptive geometry: First part (19 lessons)—Surfaces generated by the motion of a rectilinear element. Second part (23 lessons)—Applications of descriptive geometry to stonecutting and to the representations of framework and parts of buildings. One-plane descriptive geometry. Drawing (42 days).

Mechanics: First part (24 lessons)—Statics. Second part (24 lessons)—Dynamics. Hydrostatics and hydrodynamics.

Astronomy (24 lessons): Through the subject, including celestial mechanics, physics of the earth, terrestrial magnetism, meteorology, and stellar astronomy.

Construction of maps (7 lessons): Perspective constructions. Conventional projections. Projections formed by the method of development, including the method of Mercator.

Gnomonics (1 lesson): The different kinds of sundials.

Physics: First part (20 lessons)—Optics, geometrical and physical, including the theory of wave motion. Second part (20 lessons)—Electricity and magnetism.

Chemistry (25 lessons): Organic chemistry.

French literature (25 lessons): History of French literature in the eighteenth and nineteenth centuries. Exercises in composition and elocution.

Flemish (35 lessons): Programme similar to the course of the first year.

Hygiene (24 lessons): Anatomy and physiology of the human body; military hygiene. Surgical guide; medical guide.

Drawing: Drawing from reliefs (20 lessons). Landscape drawing (30 lessons).

Military regulations (35 lessons): Field service and garrison service. School of the battalion and regiment. Mounting and dismounting of arms.

Exercises: Military exercises and drills. Gymnastics. Fencing. Riding. Swimming.

THIRD YEAR.

Applied mechanics (37 lessons): Hydraulics properly so called. General theory of machines.

Topography (16 lessons): Map making and map reading. Planimetric methods. Leveling. Hasty topography. Topographical reconnoissances. Telemetry. Practical applications.

Applied physics (26 lessons): Thermodynamics. Electrical physics. Electric lighting.

Chemistry (20 lessons): Explosives. Lighting by gas. Water; classification of different kinds of water from the hygienic point of view, and filtration of water.

Geology (16 lessons): Elements.

Civil engineering (41 lessons): Strength of materials. Knowledge of materials. Roads and railroads.

Military art (55 lessons): First part—Recruiting; organization; mobilization; applications. Second part—Strategy (with applications on the map). Third part—Tactics (with practical operations of small units and applications on different kinds of ground).

Artillery (50 lessons): Preliminary ideas, including elementary ballistics. Artillery material; laying and firing.

Fortification (75 lessons): Permanent fortification. Temporary fortification. Attack and defense of fortresses. Instruction journeys and practical work.

Languages (one lesson per week in each language): Flemish, German, or English; continuation of the studies of the first two years.

Exercises: Riding.

FOURTH YEAR.

Applied mechanics (25 lessons): Steam engines and other motors depending upon the conversion of heat into mechanical energy. Principles of engine construction.

Geodesy (16 lessons): Instruments employed in geodesy. Triangulation, etc. Latitudes, longitudes, azimuths. Leveling, mechanical geodesy.

Applied chemistry (25 lessons): Combustibles. Iron and steel and various metals. Materials of construction. Manufacture of glass. Oils, colors, paints, and dyes.

Photography (6 lessons): Elements and practical applications.

Civil engineering, etc.: (*a*) Course of both sections (15 lessons)—Elements of graphical statics; trusses. (*b*) Course special to the engineer section (45 lessons)—Trusses; stability of masonry; execution of masonry. (*c*) Course special for the artillery section (6 lessons)—Resistance of tubes; hooping of guns.

Architecture: (*a*) Course for both sections (16 lessons)—Composition; decoration, orders, and styles of architecture; ogival architecture; mediæval architecture; military architecture; modern architecture. (*b*) Course special to the engineer section (12 lessons)—Construction of buildings.

Military art (30 lessons): Fourth part—Military geography. Fifth part—Military history, including the Franco-German war as far as the capitulation of Sedan.

Legislation (8 lessons): Elements of military justice, discipline, the law of nations, and military instruction and education.

Artillery: (*a*) Course for both sections (13 lessons)—Service and tactics of artillery in sieges and in fortified places; construction of batteries. (*b*) Course with a common programme for both sections, but more detailed for the artillery than for the engineers (25 lessons for the artillery section and 10 for the engineer section)—Theory of the construction of carriages; machines for mechanical maneuvers; pontoon and temporary bridges, including foreign bridges; foreign artillery. (*c*) Course special to the artillery section (35 lessons)—Service and tactics of artillery in the field; ballistics, exterior, interior, and penetration.

Fortification: (*a*) Course for both sections (20 lessons)—History of fortifications; connection of fortifications with strategy; defense of States; Belgian defensive system. (*b*) Course special to the engineer section (14 lessons)—Mines; military bridges; plans of fortification.

Administration (25 lessons): Preliminaries; service of administration in the units of the troops; allowances, etc. Arms, ammunition, clothing, camp and garrison equipage. Funds kept up in the different corps, etc. System of accountability of corps, etc. Practical exercises.

Languages (one lesson per week in each language): Flemish, German, or English; continuation of studies of the first three years.

Practical exercises: Visits to the principal military establishments, polygons, powder works, gun shops and arsenals, battlefields, etc. Practical exercises in fortifications, etc., on the terrain. Riding.

The classification lists drawn up by the director of studies at the end of the third scholastic year serve as a basis for the provisional assignment of the student second lieutenants to the artillery and engineer arms.

The graduating examination, held at the end of the fourth scholastic year, serves to determine the definitive assignment of the student second lieutenants to the artillery and engineers. This examination is oral and public. It covers the most important subjects taught during the applied course of the last two years at the school.

Infantry and cavalry section.

FIRST YEAR.

Geometry (10 lessons): Properties and graphical constructions of such curves as the ellipse, hyperbola, parabola, and the helix.

Descriptive geometry (33 lessons): Through the elements of perspective.

Mechanics (16 lessons): Cinematics, statics, and dynamics, elements of each, with a short course on steam, hydraulic and gas engines, etc.

Topography (24 lessons): Same course as in the section of artillery and engineers (third year).

Physics (36 lessons): Elements of, and elements of heat, optics, acoustics, electricity, and magnetism, with practical applications.

Chemistry (45 lessons): Elements of inorganic chemistry.

Artillery (40 lessons): Elements of the science of gunnery, and description of Belgian and foreign small arms and artillery; also bridges constructed with the Belgian bridge equipages.

French literature (25 lessons): Same programme as in the section of artillery and engineers (first year).
Flemish (35 lessons): Same programme as in the section of artillery and engineers.
German or English (35 lessons): Same programme as in the section of artillery and engineers.
Hygiene (24 lessons): Same programme as in the section of artillery and engineers (second year).
Drawing (65 lessons): Picturesque drawing and pen-and-ink sketching.
Military regulations (55 lessons): Same programme as in the section of artillery and engineers (first year).
Exercises: Military exercises and drills. Gymnastics. Fencing. Riding. Swimming.

SECOND YEAR.

Cosmography (14 lessons): Elements of.
Military art (97 lessons): First, second, and third parts—Same programme as in the section of artillery and engineers (third year). Fourth part—Military geography; elements of the military geography of Europe. Fifth part—Military history; same programme as in the section of artillery and engineers (fourth year).
Legislation (8 lessons): Same programme as in the section of artillery and engineers (fourth year).
Fortification (60 lessons): First part—Permanent fortification. Second part—Temporary fortification. Third part—Attack and defense of fortresses and the defense of States.
Administration (25 lessons): Same programme as in the section of artillery and engineers (fourth year).
French literature (25 lessons): Same programme as in the section of artillery and engineers (second year).
Flemish (35 lessons): Same programme as in the section of artillery and engineers.
German or English (35 lessons): Same programme as in the section of artillery and engineers.
Hippology (16 lessons): Same programme as in the section of artillery and engineers (first year).
Drawing (18 lessons): Landscape drawing; drawing from nature.
Military regulations (45 lessons): Field and garrison service; schools of the battalion and regiment; mounting and dismounting arms.
Exercises: Military exercises and drills. Gymnastics. Fencing. Riding. Swimming.

TIME-TABLE—WEEK DAYS.

The following table of the distribution of studies and employment of time has been in force, with very slight modifications, ever since the practical organization of the school, in 1838:

From 5 to 5.45 a. m.: Rise. Policing. Roll call at 5.45 a. m. in the class rooms.
From 5.45 to 8 a. m.: Studies.
From 8 to 8.30 a. m.: Breakfast.
From 8.30 to 10 a. m.: Lessons.
From 10 a. m. to 12.30 p. m.: Drawing. Studies. Questions in the professors' rooms.
From 12.30 to 2 p. m.: Lessons. Studies.
From 2 to 5 p. m.: Dinner. Military exercises. Fencing. Wednesdays, liberty from 2.30 to 4.45 p. m.
From 5 to 8 p. m.: Lessons. Studies. Questions.
From 8 to 9.30 p. m.: Supper. Taps (lights out) at 9.30 p. m.

As a result of the high standard of admission to the Ecole Militaire and the keen competition for admission thereto, there are generally but few failures to complete the course of instruction. At the examinations for entrance in the year 1892–93 the total number of candidates was 317, of whom 129 were from the army and 188 from civil life. The total number successful was 84, of whom 26 were from the army and 58 from civil life. At the school examination at the end of this year the total number of cadets examined was 305, of whom 33 failed to pass. For the three years previous the total examined and the number of failures are tabulated below:

Year.	Number examined.	Number of failures.
1891–92	338	16
1890–91	329	5
1889–90	344	4

The number of failures appears to be steadily increasing. The cause of this is not clear.

In the year 1892–93 the number of competitors for entrance to the "Cours central de préparation à l'École militaire" was 37, of whom 20 were admitted. Of these, 3 were sent back to their regiments during the year, leaving 17, all of whom passed successfully at the end of the school year. Only 4 of these, however, were successful in the competition for admission for the École militaire.

In the graduating class of the "Cours central" immediately preceding, out of 25 who passed the final examinations 14 were admitted to the École militaire.

Text-Books Employed at the École Militaire.

The official programme does not give any of the text-books employed, but a few of them are mentioned in the list of works recommended to persons preparing for the entrance examinations. Many of the text-books are peculiar to the school, being only issued in lithographed form, and intended solely for the use of the students and instructors of the school.

ITALY.

At the present time—April, 1895—the military schools of Italy are divided into three classes, viz:

1. The collegi militari, or military preparatory schools, of which there are five, established in the following cities: Naples, Florence, Milan, Rome, and Messina.

2. The military schools for the training of officers and noncommissioned officers, of which there are four, viz: (*a*) The military school of Modena, (*b*) the military academy of Turin, (*c*) the military sanitary school of application in Florence, and (*d*) the noncommissioned officers' school in Caserta.

3. The "scuóle militari complementari," or the military schools of application proper, for officers, of which there are three, viz: (*a*) The war school (Scuola di Guerra), in Turin; (*b*) the school of application of artillery and engineers, in Turin; and (*c*) the school of cavalry, in Pinerola.

There are, in addition to the schools mentioned above, schools for artillery and musketry practice, a school of fencing, and batteries and platoons of instruction for training noncommissioned officers in their duties.

Circular No. 3, of the 5th of January, 1893, published in the Giornale Militare Ufficiale for that year, stated that the minister of war would not promise that after the school year 1893–94 there would be any more admissions to the lowest classes of the collegi militari. This order foreshadowed a gradual winding up of these schools. Accordingly, it appears that there were no admissions to the collegi militari during the past year, and none are indicated in the orders for this year.

Indeed, a royal order of the 6th of November, 1894, decreed the abolition of these schools. Before this decree takes effect, however, it must be approved by Parliament, and it is now considered doubtful whether this approval will be given or whether the collegi militari will be allowed to continue.[1]

SCHOOLS FOR THE TRAINING OF OFFICERS.

Of these, the schools which correspond most nearly to the United States Military Academy are the Scuóla Militare, of Modena, and the Accademia Militare, of Turin.

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[1] Since the above was written a number of changes have been officially announced, which went into effect October 1, 1895. Instead of abolishing all the collegi militari, those at Rome and Naples have been retained, provisionally, at least. The noncommissioned officers' school at Caserta has been abolished, and in lieu thereof a special course for noncommissioned officers who are aspirants for promotion has been established at the military school of Modena.

I. THE SCUOLA MILITARE, OR MILITARY SCHOOL, OF MODENA.

The object of this school is to furnish officers to the infantry and cavalry arms and to the commissariat corps of the royal army.

The course of study is completed in two scholastic years, at the end of which those students who pass the prescribed examinations are appointed second lieutenants in the infantry or cavalry or in the commissariat as fast as vacancies occur.

Admission to the military school.—The number of admissions yearly to the lowest class of the military school is fixed by the minister of war, and published, generally in the month of January or February, in the Giornale Militare Ufficiale (Official Military Journal). These places are granted (*a*) to the boys who have passed successfully through the fifth and last class of the collegi militari; (*b*) by competitive examination, to such boys as show themselves to be the best qualified, the examination being based upon the programme of admission; (*c*) by award based upon the ratings shown in school diplomas or certificates, to such boys as have obtained the diploma of a classical school (liceo), or of a technical school (istituto tecnico). Diplomas more than a year old are not admitted, unless the candidate has been prosecuting his studies in some higher institution of learning. Only the diplomas of the following courses of the technical schools are accepted: Physics and mathematics, land surveying, commercial course and bookkeeping.

When the number of qualified candidates is greater than the number of places to be awarded, then preference is given first to the graduates of the collegi militari, then to students showing certificates of courses of study higher than those of the classical schools, next to the students showing the diploma of the classical school, next to the students showing the diploma of the technical school, and, lastly, to those who have undergone the competitive examination, in the order in which they pass.[1]

Boys who are Italian citizens, and soldiers with the colors or on unlimited leave are eligible to compete for places in the military schools, provided they possess the following qualifications:

1. They must be between the ages of 16 and 20 on the 1st of August of the year of admission.

2. They must have reached the height of 1.55 m. if they are over 18 years of age. For those who are under this age, the height may be less; but in this case they must give promise of reaching the minimum height by the time they attain the age of 18.

3. They must be well developed and of robust constitution and free from defects that would be a ground for discharge from the army. The chest measurement, for competitors who have not reached the age of 20, may be less than 800 mm., but it should correspond to the physical development of the subject, and should give promise of reaching the minimum by the time the subject is 20 years of age.

4. They must, if they are minors, have the consent of their fathers. In any case where the father is not living the consent of the mother is necessary, or, if both parents are deceased, the consent of the guardian must be had.

5. Their moral character must be good, and they must not have been expelled from any military or civil school.

The graduates of the collegi militari and the other successful candidates for admission to the military school are subject to a medical examination on their arrival at the school, and those found to be physically unfit are rejected.

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[1] According to the decision of the minister of war (Giornale Militare Ufficiale, part 1, p. 66, 1896), all candidates for admission to the military school and military academy for the year 1896 will be subjected to a competitive examination, the subject-matter of which comprises Italian literature, mathematics, and the French language. From this examination, graduates of the collegi militari are apparently excepted. All candidates for this competition must be provided with the diploma of either a classical school or a technical school. Admission to the military academy is still subject to the passing of the complementary competitive examination.

However, graduates of the collegi militari who do not pass this physical examination may, nevertheless, be admitted; but if such boys do not qualify physically before finishing the course at the military school, they are forthwith discharged from the school and are not commissioned in the army.

Requests for admission to the competitive examinations must be made between the 1st of May and the 15th of June of the year in which the admission to the school takes place;[1] requests to be allowed to present diplomas for competition must be made between the 1st of July and the 5th of August. All the requests are eventually transmitted to the minister of war.

The minister reserves the right of excluding from admission such boys as, for any reasons whatever, he decides to be unworthy of holding a commission in the army.

Examinations for admission.—The subjects of the examination for admission to the military school are given in the following table; the programmes in each subject will be given later:

Group of subjects.	Subjects.	Method of examination.	Duration of examination.	Coefficients.
1	Italian language and literature	Written Oral	4 hours 20 minutes	7
2	History, geography, elements of natural sciences.	Oral	50 minutes, altogether.	5
3	Arithmetic and algebra; geometry, trigonometry.	Oral	50 minutes, altogether.	5
4	French language	Written Oral	4 hours 15 minutes	3

The written examination in the Italian language and literature will precede all the others, and in order to be admitted to the other examinations it is necessary to qualify in this.

The examinations are made by committees, each of which is divided into four subcommittees (one for the oral examination in Italian language and literature; one for the examination in history, geography, and natural sciences; one for that in mathematics, and one for that in the French language). Each subcommittee consists of a president and two members.

In the oral examinations, questions drawn by lot by the president of the subcommittee are put to the candidates, one question in each subject, except in the examination in history, when three questions are put (one in Greco-Roman history, one in mediæval history, and one in modern history), and in arithmetic and algebra, where two questions are put (one in arithmetic and one in algebra).

However, additional questions may be put if the subcommittee so desire. For each subject and for each method of examination (that is to say, written or oral) the subcommittees take distinct votes, as follows:

First, the examiners vote "yes" or "no" on the question whether the candidate is qualified in any given subject and in any particular kind of examination; then, another vote is taken to determine the candidate's mark—marks from 10 to 20 being given to candidates declared to be qualified and marks from 0 to 9 to those declared to be not qualified.

The true mark for each candidate on each vote is determined by taking the sum of the marks of the three examiners and dividing the sum by 3.

The mean of the marks for each "group" is obtained by taking the arithmetical mean of the marks given on each vote in all the different subjects of this group.

To obtain the general average for any candidate, multiply the mean mark on each group by the proper coefficient; take the sum of the products and divide by 20.

[1] The limits of time for the year 1896 are from May 1 to August 5.

To be declared qualified for admission a candidate must obtain a qualification by a majority of votes in every separate vote.

However, a candidate may be declared qualified for admission who does not qualify on every vote, provided that his mark on any such vote does not fall below 8–20, and his general average does not fall below 14–20.

SYNOPSIS OF THE PROGRAMMES FOR THE EXAMINATION TO ENTER THE FIRST YEAR OF THE MILITARY SCHOOL.

Italian language and literature.—Written examination. A prose composition, an exercise in invention, on a theme given by the minister. In this the candidate must give proof of knowing how to express and develop the appropriate ideas in their logical order in a simple, clear, and correct style.

Oral examination.—The candidate must be able to read and explain an easy piece of prose or poetry, and to reply to a question relating to one of the following subjects: (*a*) Grammar and rhetoric; (*b*) Italian literature from the twelfth century to the present time.

History.—(*a*) Greek and Roman history down to the fall of the Roman Empire; (*b*) history of the Middle Ages, with particular reference to the history of the various Italian States, and the House of Savoy especially; (*c*) modern history, with particular reference to the history of the Italian States and the House of Savoy; the Reformation, the French Revolution, and the Napoleonic wars; history of Europe since 1815; unification of Italy.

Geography.—(*a*) Elements of cosmography. (*b*) General principles of geography; Italy—continental, peninsular, and insular; political divisions of Italy, Asia, Africa, Oceanica, and America—general ideas only.

Elements of natural sciences.—Mechanics: Matter, force, solids, liquids, gases, elasticity, gravity, heat, light, magnetism, electricity, chemistry, astronomy, physical geography, zoology and natural history, botany.

Arithmetic and algebra.—Arithmetic: Through the subject. Algebra: Through the solution of equations of the second degree with one unknown quantity; arithmetical and geometrical progressions; exponential functions and logarithms; solution of exponential equations by means of logarithms. Geometry: Through plane and solid geometry. Trigonometry: Plane. Through the solution of oblique angled triangles, and the determination of the area of triangles.

French language.—Written examination. Translation of a short tale or romance of an easy style from Italian into French. Oral examination; Grammatical rules and their application; Conjugation of the regular verbs; irregular verbs; Exercises in reading; Grammatical analysis; construction of the sentence.

The course of instruction at the military school commences in the month of October. The boys admitted in the year 1893 were ordered to report at the school on the 12th and 14th of the month; those admitted in 1894, on the 14th and 15th of the month.

The number of admissions, as has already been stated, is fixed every year by the minister of war. Two hundred and seven were admitted in 1893, of whom 60 came from the collegi militari, 95 from the diploma competition, and 52 from the ordinary competition. In 1894 the total number of admissions was 250, of whom the collegi militari supplied 104, the diploma competition 134, and the competitive examination only 12.

The orders for 1895 state that the number of admissions to the military school this year will be 120.[1] (Giornale Militare Ufficiale, Circular No. 12, 25 January, 1895.) Apparently the number does not include those who will be admitted from the fifth class of the collegi militari.

Terms of payment; free and half-free places.—The cost of pension (or board) is 900 lire, or francs, for the scholars of the military school and military academy, the installments of which are paid quarterly and in advance. In addition each scholar must pay, on admission, for his first equipment, a sum of 350 lire. From this last contribution the scholars promoted from the collegi militari are exempted.

There is also an annual contribution from each scholar of 120 lire, payable in advance in installments, which is intended to provide for the renovation and repair of clothing and equipment, and to supply text-books and other necessary articles.

Free places, as such, are granted only to the sons of officers of the army or navy and some of the civil services, where such officers have been killed in battle, or have died of wounds or disease received or contracted in the field.

[1] For 1896 the number of admissions announced is 170.

Half-free places are granted for family services, (*a*) to the sons of officers of the army and navy who have served at least eight years, (*b*) to the sons of certain persons who have received military decorations, (*c*) to boys belonging to families who have rendered distinguished services to the State.

Half-free places are granted on account of personal merit, (*a*) to boys who are admitted to the military academy or the military school on the diploma competition; (*b*) to boys who are admitted to either of these schools on competitive examination, provided they stand in the first tenth of the total number admitted on such competition, and provided also that their general average does not fall below 16–20; (*c*) to such pupils in the collegi militari, military school, and military academy as stand in the first tenth of the total number of those promoted a year in each of these establishments, provided that their general average does not fall below 16–20.

A boy may be entitled to a half-free place for two different reasons; in such a case he gets a free place.

The exemption accompanying a free or half-free place refers only to the pension or board money. The contribution for first equipment and the contribution for repairs, etc., must be paid in all cases and by all classes of scholars. Pupils coming from the collegi militari, or any of the other national military schools, are exempt, however, from the contribution for first equipment.

Assignments.—Those pupils of the military school who desire to be assigned to the cavalry must make their applications therefor immediately after entering the school.

Those who desire to be assigned to the commissariat corps must make their applications therefor immediately after their entrance into the second-class year.

Those who make applications for the cavalry must deposit 4,000 francs, or its equivalent, to pay for two horses and the necessary horse equipments when they are promoted to be second lieutenants of cavalry.

At the end of the first year of the course the aspirants for the cavalry will be subjected to an examination in equitation, and those who are pronounced unfit for the cavalry will be assigned to the infantry section.

Toward the end of the month of January the pupils of the second year who are aspirants for the cavalry are examined again in equitation, and those who are pronounced unfit are assigned to the infantry section.

At the end of the second year those applicants for the cavalry who do not pass in equitation are not allowed to be reexamined, but are turned back a year, unless they choose assignment to the infantry.

Military school—Course of instruction.

Subject.	First-year coefficients.			Second-year coefficients.		
	Number of lessons.	Course.	Examination.	Number of lessons.	Course.	Examination.
Italian literature:						
Written	70	5	7	60	5	7
Oral		3	4		3	4
Physical and natural sciences	60	3	5	.....	.....	.....
Small arms and artillery	40	3	5	.....	.....	.....
French and German language	60	3	5	60	3	5
Topography	60	4	6	.....	.....	.....
Topographical drawing	50	2	3	.....	.....	.....
Graphical projections (descriptive geometry)	40	3	.....	.....	.....	.....
Military history	60	3	5	60	3	5
Military art	60	4	6	60	4	6

Military school—Course of instruction—Continued.

Subject.	First-year coefficients.			Second-year coefficients.		
	Number of lessons.	Course.	Examination.	Number of lessons.	Course.	Examination.
Law, political and military	.....	.....	.....	50	3	4
Military geography	.....	.....	.....	70	3	6
Fortification (drawing included)	.....	.....	.....	100	3	6
Military accounts	.....	.....	.....	20	3	.....
Military regulations:						
Theoretical	50	2	3	50	2	3
Practical	150	3	5	150	4	7
Gymnastics / Fencing	120	2	.....	90	2	.....
Riding (for infantry cadets)	.....	.....	.....	60	2	.....
Conduct	.....	4	.....	.....	4	.....
Military aptitude	.....	2	.....	.....	3	.....
Total	830	46	54	830	47	53
Riding (for the cavalry aspirants)	120	.....	.....	200	2	4
Mark for the practical period of instruction (instructional camp), to be added to the final average:						
Military instruction	.....	.01	.....	.....	.01	.....
Topographic exercise	.....	.01	.....	.....	.01	.....

Marking and standing.—The final standing of pupils at the military school is determined after the examinations, which are held at the end of each scholastic year, but the pupils receive marks on the progress they have made during the course, determined by their written work, their drawings, and their answers to questions put to them by the professors and instructors during the lectures and class instruction.

Marks are also given by the instructors in riding, fencing, and gymnastics for each pupil at the end of every two months.

Marks are given in conduct and military aptitude by the company commanders at the end of every four months.

The standing is made out in the middle of the year, on the basis of the marks given during the term; the average mark of each scholar is multiplied by the corresponding coefficient and the sum of the products is taken. Dividing this sum by the sum of the coefficients gives the general average for each scholar. The scholars then take rank according to their respective general averages. Those scholars are declared deficient who obtain a mark less than 10-20 in any subject.

At the end of each scholastic year the average for the term's work is determined and combined with the average resulting from the examination. In this way is established the yearly general average, on which depends the final standing of the pupils in each class.

In order to be promoted a class, or to graduate, a pupil must obtain in each subject a general average of not less than 10–20, and in all subjects a final general average of not less than 11–20, including the marks given for conduct and military aptitude.

Those pupils who fail to qualify are turned back a year. If they have already been turned back one year, they are transferred to some corps of the army to finish the time for which they are liable to military service.

The time for which boys who enter the military school or the military academy bind themselves to serve in the army is determined by the law of "Arruolamento voluntario ordinario," or ordinary volunteer enlistment. This time is four years in the cavalry and three years in all the other arms. Those scholars of the military school who fail in their graduating year in any branch except military regulations may enter the army as sergeants, being assigned to corps in accordance with their applications. Such scholars must contract to serve for five years, in which time their two years at the military school will be counted.

Assignment to regiments on graduation.—The assignments to regiments are made in accordance with the following rules:

Those graduates who are in the first tenth of the whole class, independently of the arm or corps for which they are aspirants, are allowed to designate the three regiments in which they prefer to serve. The other graduates will have no choice, but will be assigned to regiments in their own arms according to the numerical order of the regiments, beginning each year with the one designated by the minister. Such graduates as are pronounced physically qualified for the "bersaglieri" (rifles), and the "Alpini" (mountain rifles), by an examining committee appointed at the school, are commissioned in those regiments, and the tallest graduates are assigned to the grenadiers.

Lots are drawn for the places in the commissariat corps when there are more applicants than there are vacancies or disposable places.

The same rule is followed when more graduates are recommended for the rifles than there are vacancies available.

As a general rule, applications from newly appointed officers for assignment to particular regiments will not be entertained by the minister of war. Exceptions for the higher graduates have been indicated.

The cavalry graduates of the military school are immediately sent to take a post-graduate course at the school of cavalry in Pinerola. Their ultimate seniority is determined by their standing at the end of the course.

Military organization, etc.—For the purpose of military instruction, drills, etc., the scholars of each class are divided into companies, which in turn are organized into two battalions; the first battalion is formed by the companies of the second year, or seniors, and second battalion by the companies of the first year, or juniors. The number of companies in a battalion depends on the number of scholars in the class.

Each company is organized in a manner conformable to the infantry drill and interior service regulations. The commanding officers of companies are captains, and the subaltern officers lieutenants detailed from the army. The acting noncommissioned officers, or "capiscelti and scelti," are appointed from the cadets of the second year who are specially qualified for such duties, from which class are also appointed the cadet instructors or drillmasters. To each company are also attached two of the noncommissioned officers of the army belonging to the school staff; also two of the school domestics, as policemen.

Each battalion of the school is commanded by a field officer, generally a major, detailed from the army. When the two battalions are united for reviews, inspection, etc., the command of the whole is generally taken by the colonel, who is second in command at the school.

The commandant of the school is a general officer, who is directly responsible to the minister of war.

II.—The Accademia Militare, or Military Academy of Turin.

The object of this school is to educate boys for the position of officers in the artillery and engineer arms.

The course of study is completed in three scholastic years, at the end of which those scholars who pass the prescribed examinations are appointed second lieutenants of artillery or engineers, with seniority from the date of their entering the last year of the course.

Admission to the military academy.—The number of admissions yearly to the lowest class of the military academy is fixed every year by the minister of war, and is published in the Giornale Militare Ufficiale at the same time that the number of admissions for the military school is announced. These places are all given in accordance with the results of a competitive complementary examination, to which are admitted only such boys as belong to the three following categories: (*a*) Boys who have graduated at the collegi militari; (*b*) boys who have obtained the diploma of a classical school or technical school, and who satisfy all the other requirements for this class of applicants as prescribed in the regulations for admission to the military school; (*c*) boys who have passed in all the subjects of the entrance examination for the military school, and who have obtained in the mathematical examination an average of not less than 14–20.[1]

All these boys must possess the same qualifications with regard to Italian nationality, age, height, etc., that are required for admission to the military school.

Complementary examination.—The subjects of the complementary examination for admission to the lowest class of the military academy are the following: Trigonometry, complementary geometry, and complementary algebra, in accordance with the programmes, which will be given later.

This examination, which is oral only and which lasts fifteen minutes for each candidate, is given by a committee appointed by the minister of war, which holds its sessions successively at the military academy and at the various collegi militari.

For each one of the three subjects mentioned above the president of the examining committee draws by lot a question from the list on the programme, and on this question the candidate is examined during the time allotted to him. The committee may, however, put further questions to the candidate on any of the subjects of examination, and may besides question him on programmes 8 and 9 for admission to the military school. (These numbers refer to geometry and trigonometry.)

With regard to the votes to be taken to determine whether a candidate is qualified, and to determine his mark and general average, the regulations correspond in general to those laid down for the military school. A final vote is taken for all three of the subjects of examination.

All those candidates who obtain a final mark of not less than 10 are declared qualified.

When the number of qualified candidates is greater than the number of vacancies the vacancies are given to those who have obtained the highest ratings on the complementary examination, irrespective of the class of competitors to which they belong.

SAMPLE QUESTIONS.

1. *Trigonometry.*—No. 8—Area of a triangle; (*a*) in functions of the two sides and the included angle; (*b*) in functions of one side and the angles; (*c*) in functions of the three sides. Area of a quadrilateral in functions of the two diagonals and the angle included between them. Area of a regular polygon in functions of the side and the number of sides. To calculate the diagonals, the angles, the area of a quadrilateral inscribed in a circle, and the radius of the circle, in terms of the sides. Problem of Pothenot.

2. *Algebra.*—No. 6—Product of m binomial factors of the form of $a+b$, $a+c$, $a+d$. * * * Number of terms; law of the exponents of a, and law of the coefficients; development of $(a+b)^m$, m being entire and positive; law of the coefficients and equality of the coefficients of terms equidistant from the two extremes; development of $(a-b)^m$; sum of the binomial coefficients and sum of the same coefficients with alternate signs.

3. *Geometry.*—No. 2—The sum of the squares of the sides of a quadrilateral is equal to the sum of the squares of the diagonals increased by four times the square of the segment which unites the

[1] See the decision of the minister of war with reference to examinations for admission to the military school and military academy for 1896 (footnote on p. 17).

middle points of the diagonals; in every quadrilateral inscribed in a circle the product of the two diagonals is equal to the sum of the products of the opposite sides; in every quadrilateral inscribed in a circle the two diagonals are to each other as the sum of the products of the sides which meet respectively at the extremities of the same diagonals; calculate the area of a quadrilateral in terms of the sides and the two diagonals; calculate the area and the diagonal of an inscribed quadrilateral, and the radius of the circumscribing circle, in terms of the sides.

The so-called "questions" of these programmes, it will be seen, are really sets of questions.

The course of instruction at the military academy commences in October. In 1893 and 1894 the boys admitted were ordered to report on the 14th of this month.

The number of admissions, as has been stated, is fixed every year by the minister of war. In 1893 the total number of admissions to the lowest class was 42; in 1894 it was 63. The orders for this year announce that 70 places will be open for competition for the class entering in October, 1895.[1]

Terms of payment; free and half-free places.—The regulations under these heads are the same as those that apply to the military school.

Military academy—Course of instruction.

Subject.	Approximate number of—		Coefficients.	
	Lessons.	Days drawing.	Course.	Examination.
FIRST YEAR.				
Finite analysis (higher algebra, spherical trigonometry, analytical geometry)	195	.....	8	12
Projective geometry, i. e., higher or non-Euclidian geometry	60	30	6	8
Physics (mechanics, electricity, magnetism, optics)	90	.....	6	8
Topography	30	30	4	5
Italian literature	90	.....	5 (2) 2 (3)	7 (2) 3 (3)
French literature	60	.....	3	4
Military law and regulations	15	.....	1	2
Right-line drawing	.....	30	3	.....
German language (optional)	30	.....	0.02	0.03
Total	570	90	.....	.....
SECOND YEAR.				
Infinitesimal analysis (differential and integral calculus)	120	.....	8	12
Descriptive geometry	60	30	6	9
Chemistry	60	.....	4	6
Italian literature	30	.....	3 (2) 2 (3)	4 (2) 3 (3)
French literature	60	.....	2	3
Field fortification	30	30	3	4
Military art (organization and logistics)	30	.....	3	4

[1] The number of places announced for October, 1896, was also 70.

[2] Composition.

[3] Questions, and oral examination.

Military academy—Course of instruction—Continued.

Subject.	Approximate number of—		Coefficients.	
	Lessons.	Days drawing.	Course.	Examination.
SECOND YEAR—continued.				
Military history (ancient, mediæval, and commencement of modern period)	60	.....	3	4
Landscape drawing	.....	30	3	.....
German language (optional)	60	.....	0.02	0.03
Total	510	90	.....	.....
THIRD YEAR.				
"Meccanicca razionale"	120	.....	8	12
Applications of descriptive geometry	60	30	6	9
Applied chemistry	60	.....	4	6
Elements of artillery	60	.....	3	4
Military art—tactics	45	.....	3	4
Military history—modern times	60	.....	3	8
Elements of administration and accounts	15	.....	2	2
Topography	30	30	3	4
Architectural drawing	.....	30	3	.....
German language (optional)	60	.....	0.02	0.03
Total	510	90	.....	.....

For military instruction and conduct the coefficients are, respectively, 8 and 6 for each year for the "course" only.

The length of the lessons and of the sessions in drawing is between one hour and an hour and a quarter.

Marking and standing.—The progress made by the different scholars during the year is measured by the marks which are given to them by the professors and instructors, and which are based on their written work and on the answers to the questions put during the lectures and class instruction.

During the first four months of the year the scholars retain the standing they had at the beginning of the term.

At the end of the first term of four months, and also at the end of the second term of this length, the standing is made out anew. The director of the studies causes to be determined the general average of each scholar. The average for each branch is determined from the marks, the written work, and the drawings, if any drawing is included in the subject.

Marks are also assigned at the end of every four months for conduct and military instruction.

Each subject has its own coefficient, established by the minister of war, for the purpose of determining the classification or standing.

To obtain the general average for any scholar, multiply the average in each subject by the proper coefficient; take the sum of these products and divide by the sum of the coefficients. To the result add the average for any optional study that has been taken, calculated in accordance with the proper coefficient fixed by the minister of war. All those whose general average in the obligatory subjects falls below 10-20 are declared deficient.

The yearly examinations.—At the end of the scholastic year, and before the examinations take place, the averages of the scholars in each branch of study are determined according to the principles already laid down. The marks are also determined for conduct and military instruction.

The votes are taken by the examining subcommittee on each scholar and in each subject. The first vote determines the matter of qualification. After this vote, another is taken to determine the mark to which the scholar is entitled. If he has been declared qualified, each of the three members of the examining subcommittee must assign him a mark not lower than 10 and not higher than 20. If he has been declared not qualified, each member must assign him a mark between 0 and 9. The definite mark is the arithmetical mean of the marks given by the three examiners.

To determine the final general average, on which depends the standing, multiply the annual average in each subject by the proper coefficient, and also the average on examination by the prescribed coefficient; take the sum of the products and divide by the total sum of all the coefficients. The general average thus obtained is increased by the average gained on optional subjects, if any.

Every scholar is declared qualified on examination when he obtains on every subject of examination a mark not less than 10–20, including the averages for conduct and military instruction.

A written examination in Italian literature will precede all the other examinations; any scholar who does not obtain on this examination a mark of at least 10–20 will not be admitted to the oral examination in the same subject.

Any scholar who is declared deficient in any subject is entitled to a reexamination in this subject, provided that his final general average is not less than 12–20. In other cases, scholars who are not qualified must repeat the year's course, unless they have already been turned back a year, in which case they are either transferred to some corps or regiment in the army to serve out their time (see page 22) or to the military school.

The scholars who fail in the first or second year's examination of the military academy have the option of entering the corresponding class of the military school. Those who fail on the graduating examination, and who can not or do not wish to repeat the course, have the same rights with regard to promotion as if they had graduated at the military school.

Assignment on graduation.—The graduates of the military academy who are appointed second lieutenants are assigned to the artillery or engineers in accordance, as far as possible, with their own applications. However, the minister has the power to make assignments according to what he may deem the interests of the service, taking into account only the particular aptitude of the officer, and disregarding his application for assignment to one corps or the other.

Before being assigned to regiments and before doing duty with troops, the graduates of the military academy who are appointed second lieutenants are sent to the school of application of artillery and engineers to finish their professional education. Here the officers of the two arms follow separate courses of instruction, and their seniority in their own arms depends on their standing when they finish this professional course.

Military organization, etc.—The scholars are organized into companies, which are divided into sections. The third company is formed of the scholars of the first-year, or lowest class, the second company corresponds to the second-year, and the first company to the scholars of the third-year. The sections into which the companies are divided are approximately equal.

The commanding officers of the companies and the lieutenants are respectively captains and lieutenants detailed from the army.

The three companies united constitute the cadet brigade.

The acting noncommissioned officers, "capi-scelti and scelti," are detailed from the cadets, one "capo-scelto" and a number of "scelti" to each company. They are taken from the cadets of the third-year, or highest, class.

In the way of practical instruction the scholars of the second and third years are exercised in riding three times a week, and the scholars of all three classes receive every week three lessons in fencing and two in gymnastics. They have besides such drills and practical military instruction as are necessary to fit them for their special arms.

Vacations.—There is an ordinary vacation or furlough every year, in the interval between the end of one course and the commencement of the next. For such cadets as have been promoted a class, the maximum length of this vacation is thirty days. For those who are to be reexamined, the vacation is curtailed more or less, according to circumstances, and the commandant of the academy may deprive any cadet of his whole vacation on account of bad conduct, etc.

Modification in the organization of the academy.—Among the reforms projected in the royal decree of the 6th of November, 1894, was the consolidation of the military academy and the school of application of artillery and engineers. At the present time (April 25, 1895) this decree has not yet been approved by Parliament, and may possibly never be carried out.

AUSTRIA.

The military schools in Austria which correspond most closely to the United States Military Academy are the Theresa Military Academy of Wiener-Neustadt, and the Technical Military Academy of Vienna.

Before proceeding to a description of either of these schools a brief reference will be necessary to the schools which prepare for these academies, which are called military "Realschulen" or technical schools. Though these schools are specially intended to prepare for the military academies, there is nothing to prevent boys from getting their preparation in other "Realschulen" or in private educational establishments. The "Realschulen" generally in Austria and Germany are intended to lay the basis for a scientific education, or what in France is called "l'enseignement moderne." The classical schools are called "Gymnasia."

The course at the military real schools is seven years, of which four are passed in the "Unter-Realschule," and three years in the "Ober-Realschule." There are four of these under technical schools, situated, respectively, at St. Polten, Güns, Eisenstadt, and Kaschau. They have in all a capacity of about 860 scholars. The superior technical school is at Weisskirchen. It has a capacity of 450 scholars.

The military technical schools also prepare for what are called the "Cadetten-Schulen" or cadet schools. The graduates of the cadet schools do not enter the army as officers, but are assigned to corps and regiments as cadets, with the actual or honorary position of noncommissioned officers. As vacancies occur they are appointed "Cadet-Officiers-Strelvertreter" (cadet officers' substitutes), in which position they exercise the functions of officers and associate with them without actually having officers' rank. After a probationary period in this position they may be nominated by the Emperor to be lieutenants of the lowest grade in their respective corps, but they must be acceptable to the officers of the unit where they have been on probation.

Armed with what is called the matura certificate, the graduate of the "Ober-Realschule" is entitled to apply for appointment to one of the military academies. In these appointments preference is given to officers' sons first, and then to sons of officials. The standing of at least "good" is required for admission to the academies. Of the graduates with this standing about 60 per cent are promoted to the Theresa Military Academy and about 40 per cent to the Technical Military Academy. Graduates of the "Ober-Realschule," with only "sufficient" standing are generally sent to the second class of a cadet school.

The following table, showing the classification list of the "Ober-Realschule" for the year 1888–89, will illustrate the system of promotion or recommendation for promotion in the Austrian military schools:

	Class I.			Class II.			Class III.			Total.
	A.	B.	C.	A.	B.	C.	A.	B.	C.	
Excellent	1	2	1	2	2	1	4	3	2	18
Very good	5	3	3	4	8	5	9	7	10	54
Good	24	26	25	28	27	30	23	30	26	239
Sufficient	16	13	12	9	9	6	7	4	2	78
Insufficient	3	2	4	2	....	2	....	....	1	15
Unclassified	1	2	4	1	1	1	....	....	1	10
Total	50	48	49	46	47	45	43	44	42	414
	147			138			129			
Ordered promoted a class	45	44	40	43	44	41	....	....	....	257
Reexamination allowed	2	2	5	2	....	3	....	....	2	16
Discharge asked by parents	....	1	1	....	....	....	....	....	....	2
Recommended for—										
Theresa Military Academy	....	....	....	....	....	....	22	25	22	67
Technical Military Academy	....	....	....	....	....	....	16	17	16	49
Transfers to cadet schools	1	....	1	....	2	....	5	3	2	14
Turned back one year	....	1	....	....	1	....	....	....	....	2
Dismissal	1	....	1	1	....	....	....	....	....	3
Discharge, physical disability	....	....	1	....	....	....	....	1	....	2
Furlough for six months	1	....	....	....	....	....	....	....	....	1
Transfer to naval school	....	....	....	....	....	1	....	....	....	1
Total	50	48	49	46	47	45	43	44	42	414
	147			138			129			

Boys enter the "Unter-Realschule" at the age of about ten. The seven years' course comprises three groups of subjects of instruction, viz:

Group A: Religious instruction; languages, German, Hungarian or Bohemian (either one), Polish (for boys whose fathers are not citizens of countries of the Hungarian Crown, Polish may be chosen in the Ober-Realschule course instead of Hungarian or Bohemian), French; geography, history, natural history, physics, chemistry, mathematics (arithmetic and algebra, geometry, geometrical drawing), descriptive geometry, free-hand drawing, calligraphy.

Group B: Drills, target practice, drills and exercises in field service, gymnastics, fencing, games, including skating, swimming.

Group C: Service regulations, deportment and sanitary instruction, singing and music, dancing.

The instruction in the Realschulen is extremely thorough. Those who do not pass the yearly examinations in July are turned back a year in their classes, or may be sent away. By the time the "Ober-Real" course is reached a sufficient number has been weeded out to prevent any crowding of the course.

THE MILITARY ACADEMIES.

The Theresa Military Academy of Wiener-Neustadt educates officers for the infantry, rifles, and cavalry; the Technical Military Academy of Vienna educates officers for the artillery, engineers, and technical troops (including the railway and telegraph troops).

ADMISSION TO THE MILITARY ACADEMIES.

The different kinds of places at the military academies are: (1) "Ararial" (imperial or treasury) places, wholly or half free; (2) "Stiftungs" (foundation or endowment) places; (3) paying places.

These different kinds of places are at the disposal of the imperial war ministry or the ministries of national defense of Austria and Hungary. The places for which there are endowments of private funds are disposed of in accordance with the stipulations of the letter of donation. The "Ararial" places are given directly by the Emperor. In awarding these places preference is given to the sons of officers, and then to the sons of officials.

The "Stiftungs" places are disposed of by competitive examination, the persons who are allowed to compete being designated by the state, county, or other authorities, or the corporations or private individuals interested.

Board (*Kostgeld*).—The price of board is 800 gulden yearly (about $320) at both academies, or half that amount for the half-free places. Besides the board money, a payment of 14 gulden at the beginning of each school year is required from each aspirant admitted to a military academy or military technical school. This is called "school money."

Qualifications for admission.—Aspirants must not be under 17 nor over 20 years of age on the 1st of September of the year they enter. These limits are the same for both academies. They must possess Austrian or Hungarian citizenship (foreigners may be admitted by special permission of the Emperor, under certain conditions). They must possess also physical fitness for military training and satisfactory moral character.

Applications for places.—These applications must be before the proper authorities by the 15th of May in each year. The necessary accompanying papers are: (1) A certificate of domicile; (2) a baptismal or birth certificate; (3) a military surgical certificate; (4) the proper school certificate.

The surgical certificate filed with the application for a place will not of itself be sufficient to secure entrance to either academy. The applicant must, in addition, pass a medical examination at the academy immediately after his arrival.

Applicants who are passed at this surgical examination are then admitted to the regular entrance examination.

Only the aspirants coming from private educational establishments are required to pass the complete entrance examination. To enter the Technical Military Academy, however, the "Ober-Realschule" graduates must pass an examination in descriptive geometry. Otherwise the "Ober-Realschule" graduating certificate, with the notation of at least "good," is sufficient for admission.

The full examinations for the civil scholars in both academies are as follows:

I.—MILITARY ACADEMY OF WIENER-NEUSTADT.

[The Theresa Military Academy.]

(*a*) *German language.*—Oral: Free delivery of a given and studied theme; different kinds of periods and expressions; knowledge of the principal periods of German literary history and of the prominent Austrian writers of the nineteenth century. Written: Paragraphs on historical, religious, and biographical themes; logical arrangement of matter in larger periods in a given theme.

(*b*) *Geography.*—Thorough acquaintance with the physical and political geography of Europe, especially of the states bordering on Austria-Hungary, including the statistical military conditions of the latter, and an acquaintance with the Austro-Hungarian monarchy in all its details; general knowledge of other parts of the world, with special reference to European colonies; knowledge of mathematical and physical geography. The aspirant must be able to give a good graphical representation of the continent of Europe, and especially of central Europe. Best text-book, Sonklar's "Geographie für die k. u. k. Militar Real-und Cadettenschulen."

(*c*) *History.*—Knowledge of the principal historical events of ancient times, of the Middle Ages, and of modern times down to the present, a correct comprehension of the correlation of these events, with special reference to the

development of Austria-Hungary. Text-books recommended: "Lehrbuch der allgemeinen Geschichte für die k. u. k. Cadettenschulen," or A. Gindely's "Lehrbuch der allegemeinen Geschichte für Obergymnasien."

(*d*) *Physics.*—General and special properties of bodies; mechanics of solid, fluid, and gaseous bodies; wave motion, acoustics, optics, heat, magnetism, and electricity, with the elementary mathematical treatment of these subjects. (See the text-books recommended for the Ober-Realschule course by Handl.)

(*e*) *Chemistry.*—Same as the course for the third year of the Ober-Realschule course. This course includes the elements of organic and inorganic chemistry, and also a knowledge of the synthesis of the more important carbon compounds. (See the text-books recommended for the higher grades of the middle schools by Roscoe.)

(*f*) *Mathematics.*—Arithmetic and algebra, including the solution of equations of the second degree with one or two unknown quantities, arithmetical and geometrical progressions, and the theory of combinations, binomial theorem.—Geometry, Planimetry, stereometry, plane and spherical trigonometry, elements of analytical geometry including right lines and conic sections. Text-book recommended, Moenik's Lehrbücher für Oberclassen.

(*g*) *Calligraphy.*—Good, legible, pleasing, and easy-running style of handwriting, in both German and Latin characters.

II.—The Technical Military Academy.

The same requirements as for the Theresa Military Academy in Wiener-Neustadt, with the addition of descriptive geometry.

Various relations of points, right lines, and planes; representation of polyhedrons, their plane and other sections; representation of curved lines, curved surfaces, and their plane and other sections; tangent planes to curved surfaces; shades and shadows.

Although scholars may be admitted to any class of the Real-Schulen on passing the required examination for that year, no one is allowed to "pass up" a year at the military academies. Aspirants are only admitted to the academies in the first-year, or lowest, class.

COURSES OF INSTRUCTION AT THE MILITARY ACADEMIES.

Rating and marking.—There are five different ratings in the Austrian military schools, and to each rating is assigned a numerical value, as follows:

"Vorzüglich," or excellent	5
"Sehr gut," or very good	4
"Gut," or good	3
"Genügend," or sufficient	2
"Ungenügend," or insufficient	1
"Schlecht," or bad	0

In order to be graded as "excellent" the average in any subject must be equal to at least $4\frac{1}{2}$, or, more correctly, must exceed $4\frac{1}{2}$.

To determine, for instance, the minimum credit which will insure the rating "excellent," take the sum of the number of subjects of instruction in the Group A, for the particular school and year; multiply this sum by 9, and divide the product by 2. When this dividend is divisible by 2, then the half plus 1 will be the minimum credit; when it is not divisible by 2, then the "grössere Hälfte," or the half plus one-half, will be the minimum credit.

In a similar manner is determined the minimum credit for the ratings "very good" and "good." In the first case the multiplier is 7, in the last case 5. To obtain the minimum credit for the rating of "sufficient," multiply the sum of the number of subjects of instruction by 2.

The following table exhibits the minimum credit for all these ratings at both of the academies:

Minimum credit for number of subjects of instruction of the Group A of the curriculum.

No.	Name of school.	Class.	Excellent.	Very good.	Good.	Sufficient.
12	Theresa Military Academy	I	55	43	31	24
16		II	73	57	41	32
22		III	100	78	56	44
	Technical Military Academy:					
11	Artillery division	I	50	39	28	22
18		II	82	64	46	36
23		III	104	81	58	46
11	Engineer division	I	50	39	28	22
17		II	77	60	43	34
22		III	100	78	56	44

The length of the whole course of instruction at both academies is three years.

The school year, which at both academies begins on the 18th of September and ends on the 17th of August, is divided into a theoretical and a practical course; the theoretical course is divided into a winter and a summer semester.

The theoretical course at the Theresa Military Academy lasts till the 30th of June, and at the Technical Military Academy till the 31st of May; the rest of the school year forms the practical course; one month is allowed for the vacation.

The subjects of instruction at the two academies and the division of these subjects among the different years of the course are indicated by the following table:

Subject.	Theresa Military Academy.			Technical Military Academy.					
				Artillery division.			Engineer division.		
	Class I.	Class II.	Class III.	Class I.	Class II.	Class III.	Class I.	Class II.	Class III.
GROUP A.									
Military correspondence	1	1	1	1	1	1	1	1	1
Hungarian or Bohemian language	1	1	1	1	1	1	1	1	1
French language	1	1	1	1	1	1	1	1	1
Geography	.....	1	1	.....	1	1	.....	1	1
General military history	.....	.....	1	.....	.....	1	.....	.....	1
Physics	.....	.....	.....	.....	.....	1	.....	.....	1
Physics and technology	.....	.....	1	.....	.....	.....	.....	.....	.....
Chemistry and technology	.....	.....	.....	1	1	1	1	1	1
Higher mathematics	1	1	1	1	1	1	1	1	1
Practical geometry	1	1	1	1	1	1	1	1	1
Descriptive geometry	1	1	1	1	1	1	1	1	1
Architecture	.....	.....	.....	.....	.....	.....	.....	.....	1
Law	.....	.....	1	.....	.....	1	.....	.....	1
Army organization	.....	1	1	.....	1	1	.....	1	1
Military administration	.....	.....	1	.....	.....	1	.....	.....	1
Artillery instruction	.....	.....	.....	1	1	1	.....	.....	.....
Study of arms	1	1	1	.....	1	1	1	1	1
Technical instruction	.....	.....	.....	.....	.....	.....	.....	1	1
Pionnier service	1	1	1	.....	1	1	.....	.....	.....

Subject.	Theresa Military Academy.			Technical Military Academy.					
				Artillery division.			Engineer division.		
	Class I.	Class II.	Class III.	Class I.	Class II.	Class III.	Class I.	Class II.	Class III.
GROUP A—Continued.									
Fortification and attack and defense of fortifications	.....	1	1	.....	1	1	.....	1	1
Drill regulations:									
Infantry	1	1	1	.....	.....	.....	.....	1	1
Cavalry	.....	.....	1	.....	.....	.....	.....	.....	.....
Artillery	.....	.....	.....	.....	1	1	.....	.....	.....
Tactics	.....	1	1	.....	1	1	.....	1	1
Service regulations	1	1	1	1	1	1	1	1	1
Horses and veterinary service	.....	.....	1	.....	.....	1	.....	.....	.....
Study of ground and representation of ground	1	1	1	1	1	1	1	1	1
Free-hand drawing	1	1	1	1	1	1	1	1	1
Total number of subjects of instruction in each year	12	16	22	11	18	23	11	17	22
GROUP B.									
Drills and field-service exercises	1	1	1	1	1	1	1	1	1
Gymnastics	1	1	1	1	1	1	1	1	1
Fencing	1	1	1	1	1	1	1	1	1
Riding	.....	.....	1	.....	1	1	.....	.....	1
Total number of subjects of instruction	3	3	4	3	4	4	3	3	4
GROUP C.									
Service regulations and deportment	1	1	1	1	1	1	1	1	1
Sanitary affairs	.....	.....	1	.....	.....	1	.....	.....	1
Swimming	1	1	1	1	1	1	1	1	1
Singing and music	1	1	1	1	1	1	1	1	1
Dancing	1	1	1	1	1	1	1	1	1
Total number of subjects of instruction	4	4	5	4	4	5	4	4	5

The course of instruction has been slightly changed from the above scheme, but the changes, though not exactly known, are of small importance.

The higher mathematics taught at the Theresa Military Academy comprise (1) algebraic analysis, (2) analytical geometry of two and three dimensions, and (3) differential and integral calculus. At the Technical Military Academy the course comprises the same branches, but a greater amount of time is devoted to the subject.

Assignment of the students to courses.—At the Theresa Military Academy the course of the first two years is common for all the students, but in the third year the pupils are assigned to the cavalry or infantry Abtheilungs according to their fitness for the mounted or dismounted service. At the Technical Military Academy the pupils upon entering are at once assigned to the engineer or the artillery Abtheilung, with a view to a special training for one or the other arm of the service. The division is continued up to the end of the course.

Organization for military instruction, etc.—At the Theresa Military Academy the pupils are organized into an infantry half battalion (two companies), officered from the army; a part of the first (upper) class is formed into a platoon for cavalry instruction, to which all the pupils of this class are assigned by turns.

The half battalion of the Technical Military Academy consists of one engineer company and one artillery company. It should be mentioned that there is at the Technical Military Academy a "Supernumerary Abtheilung," the students of which have been judged not fit for active military service. They are under training for the branches of the administrative services.

Graduation and obligation to serve in the army.—Graduates of the military academies whose standing is at least "good" are assigned to the army as lieutenants; those whose standing is at least "satisfactory" enter as cadets, and those below the rating of satisfactory are assigned to the army as noncommissioned officers.

Graduates who have held "ararial" or "stiftungs" places are bound to serve in the army one year for every full year's instruction in the military schools or academies; those who have held half-free "ararial" places must serve half a year for every full year of instruction, plus the three years' regular service, but no pupil who has held a free place is obliged to serve more than ten years, and no one who has held a half-free place is obliged to serve more than seven years in the army.

Such pupils as change from a place of one kind to another during the course of instruction are bound by the service obligation attached to the last kind of place held; but in this case the total time of obligatory service is not to exceed seven years.

Those pupils who for any reason leave any of the military educational establishments without completing the course of instruction are only obliged to serve their regular time with the colors (three years).

The number of students in each of the academies for the year 1895 is fixed in the army list as follows: Theresa Military Academy, 450; Technical Military Academy, 279.

These numbers are hardly ever equaled; for instance, the budget for 1895 appropriates for only 400 at the Theresa Military Academy and 230 at the Technical Military Academy.

In the two military academies the number of "stiftungs" places amounts to 107; the total number of "pay places" is 75, and of the half-free places, 13. The remaining places, amounting to about 450, are apparently all "ararial" or free places.

ENGLAND.

The schools which correspond most nearly to the United States Military Academy are the Royal Military Academy, at Woolwich, and the Royal Military College, at Sandhurst.

I.—THE ROYAL MILITARY ACADEMY.

1. This institution is maintained for the purpose of affording a special military education to candidates for commissions in the royal artillery and royal engineers. Candidates must, in the opinion of the commander in chief, be in all respects suitable to hold commissions in the army.

The commander in chief is the president of the Royal Military Academy.

An independent inspection will be made annually by a board of visitors,[1] appointed by the secretary of state for war, and reporting to him. Such visitors will not be a permanent body, but will not all be changed at the same time. The report of this board will be presented to Parliament.

The academy will be under the control of a military officer, styled governor and commandant, appointed by and responsible to the secretary of state for war, through the commander in chief.

The governor will be assisted by a staff officer styled the assistant commandant and secretary, who will be responsible in his temporary absence for the charge of the establishment. This officer will command the cadet company, and have the custody of the records and correspondence of the academy, and will give the governor such assistance as he may require.

[1] The same board inspects both Woolwich and Sandhurst.

The organization will be on a military basis.

The governor will be assisted in the arrangement of the studies by a board composed of the assistant commandant and the professors or senior instructors of the different branches. The head of each branch will have the supervision and inspection of the studies in his department and will report on them to the governor.

2. *Regulations for admission.*—Admission to the Royal Military Academy as cadets will be granted to the successful candidates at an open competitive examination.

The number of cadets admitted to the academy will vary according to the requirements of the service, and notice will be given from time to time of the number of vacancies open to competition. At the examination which commenced November 12, 1895, the number of vacancies to be competed for was 40.

The dates of admission will be on the Wednesday of the week in which the 27th of January or 11th of March falls each year.

The examination of candidates for admission to the academy will be conducted by the civil service commissioners. The examinations will be held in London and at such other centers as the commissioners may appoint. (Fees are from £1 to £3.)

The number of trials allowed will not exceed three.

The successful candidates will be inspected by a medical board, and no candidate will be considered eligible for admission to the academy unless certified by the board to be free from bodily defects or ailments, and in all respects fit for Her Majesty's service.[1]

The limits of age for admission to the academy will be from 16 to 18. Candidates must be within those limits of age on the 1st of July for the summer examination and on the 1st of December for the winter examination.

3. *Examinations.*—The examinations will be held half-yearly, and will commence in June and November; due notice will be given of the dates of the examinations, and every candidate for those examinations must send to the military secretary, on a date not later than the 1st of May or 1st of October, respectively, an application in his own handwriting to attend the examination. Candidates will be supplied with a "form of particulars," which should be carefully filled up and signed, and returned without delay to the military secretary, accompanied by the following papers:

(*a*) An extract from the register of his birth (or an equivalent legal paper).

(*b*) A certificate of good moral character, signed by the tutors or heads of the schools or colleges at which he received his education for the four years immediately preceding the date of application, or some other satisfactory proof of good moral character.

(*c*) If the candidate holds a commission in the militia, a recommendation from the commanding officer of the regiment.

4. The subjects of the examination and the maximum number of marks obtainable for each subject will be as follows:

CLASS I.

(1) Mathematics: (*a*) Arithmetic, including vulgar and decimal fractions, proportion, and simple interest; (*b*) algebra, up to and including the binomial theorem; the theory and use of logarithms; (*c*) Euclid, Books I to IV, and VI; (*d*) plane trigonometry, up to and including solution of triangles, and mensuration; (*e*) statics; the equilibrium of forces acting in one plane and of parallel forces, the center of gravity, the mechanical powers; dynamics—uniform, uniformly accelerated, and uniform circular motion, falling bodies and projectiles in vacuo. Analytical methods of solution will not be required; 3,500 marks.

(2) Latin, 2,000 marks.

(3) French or German (200 for colloquial), 2,000 marks.

(4) English composition, including spelling and handwriting, 1,000 marks.

(5) Drawing, geometrical, including spelling and handwriting, 1,000 marks.

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[1] The present minimum standard for officers is 5 feet 4 inches in height, and 33 inches chest measurement.

Candidates will be required to show a satisfactory knowledge of each of the above-mentioned branches of mathematics, and must also obtain such an aggregate of marks in the subjects of Class I as may satisfy the civil service commissioners. Candidates who have previously to January 1, 1894, passed the army preliminary,[1] or any other of the examinations which have hitherto been accepted as equivalent thereto, will not be rejected for failing to qualify in arithmetic or to obtain the aggregate required in Class I.

CLASS II.

(1) Higher mathematics: In all the following subjects a great importance will be attached to accuracy in numerical results: Further questions and problems on the subjects of the obligatory examination: Statics; problems and exercises will be extended to friction; (the graphical or geometrical method of treating such problems should be studied, as well as the analytical; no application of the differential calculus to statics will be required). Dynamics, problems, and exercises will be extended to collisions and work. (Analytical methods of solution, but not the use of the differential calculus will be involved.) Analytical geometry, problems on straight line and circle. Conic sections, elementary properties with easy problems, both on the analytical and geometrical methods, 2,000 marks.

(2) German or French, as alternating with subject 3, in Class I (200 for colloquial), 2,000 marks.

(3) Greek, 2,000 marks.

(4) English history: There will be set one general paper; one paper limited to a fixed period, of which notice will be given, 2,000 marks.

(5) Chemistry: Elements of inorganic chemistry, 2,000 marks.

(6) Physics: Elementary properties of electricity, magetism, heat, light, and sound, 2,000 marks.

(7) Physiography and geology, 2,000 marks.

In each of the subjects (5), (6), and (7) the examination will be partly practical.

Only two of the subjects in Class II can be taken up.

CLASS III.

(1) Geography, 500 marks.

(2) Drawing, free-hand, 500 marks.

Both these subjects may be taken up.

The number of marks allowed to each candidate in the several subjects in which he has been examined will be summed up, and the resulting total will determine the place of the candidate in the competitive list, the successful candidates being those who stand at the head of the list up to the number of cadetships competed for.

5. *Time-table, November, 1895.*—The examinations covered the time from the 12th to the 23d of November, inclusive, the hours of attendance being from 10 a. m. to 5.30 p. m., with an intermission for lunch.

The medical examination of the successful candidates takes place after the result of the examination has been announced, and is held in London.

NOTE.—Some of the rules prescribed for the conduct of the examinations are as follows:

No candidate may quit the examination room until the expiration of half an hour from the time fixed for the commencement of the paper on which he is engaged.

No candidate who has left the examination room during the hours assigned to paper work may return to the paper which he has quitted without special permission, obtained before he leaves the room. In such cases the commissioners will decide whether marks can be allotted.

During the whole of the examination each candidate will be designated by the number assigned to him on the time-table, and he must write this number (not his name) on every book or separate sheet of paper which he sends in.

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[1] Formerly the entrance examination for Woolwich was divided into the "preliminary" and the "further" examinations. The present regulations, which went into effect January 1, 1894, abolished the "preliminary examination." It covered much the same subjects as those mentioned in the present Class I.

TABLE A.—*Extract from table of marks showing the marks obtained by the successful candidates for admission to the Royal Military Academy, Woolwich, November, 1895.*

I.—SUCCESSFUL CANDIDATES.

Number in order of merit.	Number in examination.	Name.	Class I (obligatory).							Class II (any two may be taken up).								Class III.		Total.
			Mathematics.	Latin.	Alternative. French.	Alternative. German.	English composition, etc.	Geometrical drawing.	Total Class I.	Higher mathematics.	Alternative. German.	Alternative. French.	Greek.	English history.	Chemistry.	Physics.	Physiography and geology.	Geography.	Free-hand drawing.	
		Maximum	3,500	2,000	2,000	2,000	1,000	1,000	9,500	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	500	500	14,500
1	150	Lewis, H. L.....	3,262	1,120	1,290	.....	684	647	7,003	1,909	.....	.....	.....	.....	1,745	.....	.....	302	227	11,186
2	217	Field, W. R.....	3,127	1,488	1,129	.....	478	780	7,002	1,505	.....	.....	.....	.....	1,107	.....	.....	500	280	10,394
*	*	* * * *																		
40	73	Reid, J. F.....	2,648	1,048	1,088	.....	340	547	5,651	1,163	1,062	.....	.....	.....	.....	.....	.....	342	252	8,470

II.—UNSUCCESSFUL CANDIDATES QUALIFIED.

[May be exempted from further examination if nominated to the Royal Military College as Queen's cadets, Indian cadets, pages of honor, or from the militia for commissions in the army.]

41	36	.....	1,751	1,255	1,090	.....	618	626	5,340	.....	1,548	.....	.....	1,110	.....	.....	.....	329	20	8,347
91	43	.....	2,501	96	363	.....	344	583	3,887	563	.....	.....	.....	.....	.....	230	.....	233	199	5,112

III.—CANDIDATES NOT QUALIFIED.

[Who failed to qualify in one or more branches of obligatory mathematics, but who may be exempted from further examination if nominated as Queen's cadets, Indian cadets, pages of honor, or from the militia.]

The candidate who passed lowest on this list obtained a total of 4,788

6. *Course of instruction.*—The length of the course of instruction will be two years, divided into four terms.

The academy terms in each year will be—

(*a*) From about the middle of April to middle of August.

(*b*) From about middle of October to middle of March, with a short recess at Christmas.

The intermediate periods will constitute the vacations.

All the cadets in the third and fourth classes will be educated together. On leaving the third class the cadets promoted to the second class will bifurcate into two separate divisions for artillery and engineers, respectively, which separation will be maintained for the remainder of the course at the academy.[1]

Cadets passing highest on the list of the third class will have the choice of joining the engineer division, so far as the vacancies may be available, with a view to obtaining commissions in the royal engineers; the remainder will be attached to the artillery division, with a view to obtaining commissions in the royal artillery.

When once a cadet has joined any particular division, no transfer will under any circumstances be allowed.

The following subjects, in addition to drill, riding, and gymnasties, will form the ordinary course of obligatory studies, with the marks assigned to each:

FOURTH AND THIRD CLASSES.

Mathematics, 3,000 marks, including 200 for plates, sketches, and notes.
Field fortification, 2,000 marks, including 400 for plates, sketches, and notes.
Military topography, 2,000 marks, including 800 for plates, sketches, and notes.
French or German, 1,000 marks.
Chemistry and physics, 1,500 marks, including 50 for plates, sketches, and notes.
Model drawing, 300 marks.

SECOND AND FIRST CLASSES.

Subjects common to the artillery and engineer divisions.

Military topography, 1,000 marks, including 400 for plates, sketches, and notes.
Tactics, 1,000 marks.
Electricity, 1,500 marks, including 100 for notes and examples.

Special to artillery division.

Artillery, 2,000 marks, including 200 for plates and notes.
Fortification, 1,000 marks, including 200 for plates and notes.

Special to engineer division.

Fortification, 2,000 marks, including 400 for plates and notes.
Artillery, 1,000 marks, including 100 for plates and notes.
Mathematics, 2,000 marks, including 100 for plates and notes.
Free-hand drawing, 1,000 marks.

In addition to the above obligatory course, every cadet will be allowed, at his option, to take up as a voluntary subject in the third and fourth classes landscape drawing; also to be examined in the third class in an advanced paper in mathematics on the course of the fourth and third classes, and in a paper on the differential and integral calculus.

[1] With regard to this system of "bifurcation," the board of visitors of 1895 remarks as follows: "The system of bifurcation, although adversely reported upon by successive boards of visitors, still continues in force. The board consider it their duty again to direct attention to this very serious flaw in the educational arrangement of the academy. The testimony of the late as well as of the present governor, whose opinion was formed from the experience he has had of the young officers who have joined the royal engineers during the time he filled the position of commandant of the School of Military Engineering, of the commandant, and of the professors, is unanimous in condemnation of the present system, under which there can be no doubt that, in addition to loss of incentive to work by a large portion of each batch, the instruction is not carried so far as it ought to be in some subjects. The board are of opinion that bifurcation should be abolished and that the courses of study should be so regulated in future that the study of each subject should be carried so far as and no further than is alike advisable or necessary for cadets about to be commissioned in either the royal artillery or royal engineers."

The maximum marks for these subjects will be 700 for landscape drawing, 0.5 being the counting minimum at each examination, and 400 for each of the mathematical papers above mentioned, 0.4 being the minimum to count marks on each paper.

A cadet will not be allowed to take up or present himself for examination in voluntary mathematics unless the professor reports that he has previously attained a sufficient proficiency in the obligatory mathematics.

The language to be studied by a cadet must be that in which he possesses such proficiency as will enable him to benefit by the advanced instruction given to the class.

7. *Examinations.*—There will be examinations at the end of each term, conducted by independent examiners. A cadet failing to pass satisfactorily at any examination will not get class promotion.

The examination in the third class will cover the fouth and third classes' course, and that of the first class the second and first classes' course.

The examinations are almost always in writing.

At the end of the course those cadets who have passed satisfactory examinations will be entitled to commissions as second lieutenants, in the royal artillery from the artillery division, and in the royal engineers from the engineer division.

For class promotion from the fourth class, and also from the third class, a cadet will be required at each examination to obtain 0.5 of the marks in the obligatory course of mathematics and in at least three other obligatory subjects, and 0.5 of the aggregate of marks allotted at that examination for the six obligatory subjects, as shown in Table C.

To count marks in an obligatory subject, at least 0.25 of the total marks for that subject in the examination must be obtained.

The marks allowed to count in the fourth class will be added to those allowed to count in the third class, and the result will determine the order of merit for appointment to the artillery and engineer divisions; but no cadet can be posted to the engineer division who does not obtain 0.5 in fortification in the examination in the fourth and third classes.

For class promotion from the second class, and also for commission at the end of the course, the following qualifications will be required:

Artillery division.—Five-tenths in artillery and in at least three other obligatory subjects, and 0.5 of the aggregate of the marks allotted at that examination for the five obligatory subjects, as shown in Table C.

Engineer division.—Five-tenths in fortification and in electricity and in at least three other subjects, and 0.5 of the aggregate of the marks allotted at that examination for the seven obligatory subjects, as shown in Table D.

To count marks in an obligatory subject at least 0.25 of the total marks for that subject in the examination must be obtained.

The marks allowed to count in the second class will be added to those allowed to count in the first class, and the result will determine the order of merit, and the cadets will be gazetted to their respective corps in the order in which they pass.

8. A cadet will be removed from the academy on the following grounds: (1) If he fall more than one term behind the class with which he originally joined the academy; (2) if he fail to acquire a sufficient proficiency in military exercises.

Exceptions to these rules are only allowed on account of illness.

9. *Prizes.*—Prizes will be awarded as follows:

At the end of the first year's course:

To the cadet who has obtained the highest number of marks in—

Mathematics.
French.
German.
Drawing.
Chemistry and Physics.

At the end of the second year's course:

To the cadet who has obtained the highest number of marks during the second year's course in—

Artillery Division:
- Artillery.
- Fortification.

Engineer Division:
- Mathematics.
- Artillery.
- Fortification.

Combined first class:
- Electricity.
- Military Topography.
- Tactics.
- Landscape Drawing.[1]

A prize for riding and one for gymnastics will be given in the first class to the cadet who shows the greatest proficiency in the same, but no marks will be awarded.

The regular hours at Woolwich are shown in the following table (B):

TABLE B.—*Hours of drills, parades, studies, etc.*

	Ordinary hours.			Special summer hours.		
	Ordinary.	Saturday.	Sunday.	Ordinary.	Saturday.	Sunday.
Reveille	6.15 a. m.	Same as ordinary.	8 a. m			
Defaulter's parade	6.30 to 7 a. m.					
Breakfast	7.15 a. m.		9 a. m			
Hospital	7.50 a. m.		10 a. m			
First study	8.15 to 9.45 a. m.			9.30 to 11 a. m.	8.15 to 9.45 a. m.	
Orderly room	9.45 to 10 a. m.			9.15 a. m	9.45 a. m.	
Second study	10 to 11.45 a. m.	10 to 11.30 a. m.		11.15 a. m. to 1 p. m.	10 to 11.30 a. m.	
Riding drill:						
First class—						
Mondays and Thursdays	11.30 to 12.30.	10.45 to 11.30.		8.30 to 9.30	10.45 to 11.30.	
Second class—						
Wednesdays	8.30 to 9.30 a. m.					
Tuesdays						
Drill (or gymnastics for fourth class)	12 to 1 p. m.			8.15 to 9.15 a. m.		
Luncheon parade	1.15 p. m	1.15 p. m				
Riding drill:						
First class—						
Fridays						
Second class—						
Thursdays	2.30 to 3.30 p. m.					
Third class—						
Mondays						
Tuesdays	2.15 to 3.15 p. m.					
Defaulter's parade	2.10 to 2.40 p. m.	2.10 to 2.40 p. m.				

[1] This subject is voluntary for the artillery division.

TABLE B.—*Hours of drills, parades, studies, etc.*—Continued.

	Ordinary hours.			Special summer hours.		
	Ordinary.	Saturday.	Sunday.	Ordinary.	Saturday.	Sunday.
Drill (or gymnastics for fourth class)	2.10 to 3.10 p. m.	.....	.....	8.15 to 9.15	.....	.....
Gymnastics for third class	2.10 to 3.10 p. m.	.....	.....	.....	.....	.....
Voluntary study (Wednesdays excepted).	4 to 5 p. m	.....	.....	.....	.....	.....
Third study	5.15 to 7.15 p. m.	.....	.....	.....	.....	.....
Dinner parade	7.30 p. m	7.30 p. m	1.15 p. m	.....	.....	.....
Roll call	10 p. m., on Tuesdays at 10.30 p. m.	10 p. m	10 p. m	.....	.....	.....
Lights out	10.30 p. m., on Tuesdays at 11 p. m.	10.30 p. m	11.30 p. m	.....	.....	.....
Check parades	3.45 p. m 8.30 p. m 9.30 p. m	3.45 p. m 6 p. m 8.30 p. m	3.45 p. m 8.30 p. m 9.30 p. m	.....	.....	.....
Sundays:						
Church parade			11 a. m			.....
Coffee lunch			5 to 6 p. m.			.....
Tea in hall			8 p. m.			.....

NOTE.—Where leaders are used in columns of "Ordinary hours," it signifies that there is nothing detailed for these hours. Where nothing is shown in column of "Special summer hours," the hours are the same as shown in "Ordinary hours."

TABLE C.—*Marks, fourth and third classes.*

Voluntary subjects.			Obligatory.							Voluntary.		
	Marks.	Counting minimum.	Mathematics.	Field fort.	Military topography.	French or German.	Chemistry and physics.	Model drawing.	Total.	Landscape drawing.	Advanced paper.	Differential and integral calculus.
1. Landscape drawing	700	0.5										
2. Advanced paper in mathematics	400	0.4										
3. Differential integral calculus	400	0.4										
Fourth class:												
Maximum			750	500	500	250	500	75	2,575	175	.....	.....
Minimum			375	(*)	(*)	(*)	(*)	(*)	1,287	87	.....	.....
Third class:												
Maximum			2,250	1,500	1,500	750	1,000	225	7.225	525	400	400
Minimum			1.125	(*)	(*)	(*)	(*)	(*)	3,612	262	160	160

* See page 38.

TABLE D.—*Marks, second and first classes.*

	Engineer and artillery divisions combined.			Artillery division.		Engineer division.				Total artillery division.	Total engineer division.
	Military topography.	Tactics.	Chemistry and physics.	Artillery.	Fortification.	Fortification.	Artillery.	Mathematics.	Free-hand drawing.		
Second class:											
Maximum	250	250	500	700	250	500	250	1,000	250	[1] 1,950	3,000
Minimum	[2]	[2]	[3] 250	350	[2]	250	[2]	[2]	[2]	950	1,500
First class:											
Maximum	750	750	1,000	1,300	750	1,500	750	1,000	750	[1] 4,500	6,500
Minimum	[2]	[2]	[3] 500	650	[2]	750	[2]	[2]	[2]	2,275	3,250

[1] These figures do not include marks for free-hand drawing.

[2] See page 38.

[3] Compulsory qualifying subject for engineer division.

10. Syllabus of the course of instruction.

The marks are apportioned as follows:

MATHEMATICS.

	Fourth class.	Third class.	Engineer division only.	
			Second class.	First class.
Notes, plates, etc.	.....	200	.....	100
Examination	750	2,050	1,000	900
Total	750	2,250	1,000	1,000
Voluntary papers	.....	800	.....	.....
	.....	3,050	.....	.....
	3,800		2,000	

FOURTH CLASS.

Subject.	Marks.	Treatise.
Algebra	150	Hall and Knight's Higher Algebra.
Trigonometry and mensuration	150	Goodwin's or Todhunter's Trigonometry (smaller edition). Brabant's Mensuration.
Analytical geometry	150	Smith's Conic Sections.
Mechanics	300	Robinson's Treatise.
Total	750	

Syllabus of the course of instruction—Continued.

THIRD CLASS.

Subject.	Marks.	Treatise.
Analytical geometry—repetition of the fourth-class course.	400	See fourth-class course.
Mechanics (plates count 200 additional), repetition of fourth-class course in dynamics and statics.	950	Do.
Applied mechanics. Stability of structures, 200 marks; strength of materials, 200 marks.	400	Crofton's Applied Mechanics, second edition, 1886.
Hydrostatics	300	Besant's Hydrostatics, edition 1892.
Plates (in mechanics)	200	
Total	2,250	
Voluntary mathematics—problems in trigonometry, analytical geometry, applied mechanics, and hydrostatics, 400 marks; differential and integral calculus, 400 marks.	800	Demoivre's Theorem; Smith's Conic Sections; Crofton's Treatise on Applied Mechanics; Besant's Hydrostatics; Greenhill's Treatise on Differential and Integral Calculus, edition 1891.

SECOND CLASS, ENGINEER DIVISION.

Geometry, including spherical trigonometry	300	Smith's Conic Sections. Spherical Trigonometry, Goodwin's Treatise, fourth edition, 1893.
Differential and integral calculus	450	Greenhill's Treatise, edition 1891.
Statics and dynamics	250	Lectures.
Total	1,000	

FIRST CLASS ENGINEER DIVISION.

Statics and dynamics	400	Lectures.
Hydrostatics	250	
Mechanism	250	Goodeve's Treatise, edition 1888.
Plates	100	
Total	1,000	

11. Fortification, practical solid geometry, and military engineering.

The marks are apportioned as follows:

	Fourth class.	Third class.	Engineer division.		Artillery division.	
			Second class.	First class.	Second class.	First class.
Notes, plates, etc.	100	300	100	300	50	150
Examination	400	1,200	400	1,200	200	600
Total	500	1,500	500	1,500	250	750

11. Fortification, practical solid geometry, and military engineering—Continued.

FOURTH CLASS.

Subject.	Marks.	Treatise.
Practical solid geometry, elementary, orthographic projection.	200	Ross's Practical Solid Geometry, edition 1887, pages 1–28. First six problems, pages 29–33.
Field fortification	200	Text-Book of Fortification and Military Engineering. Part I, edition 1892. Paragraphs 1, 4, 5, 8, 10, 16, 18, 27, 66–91. Also lithographs of works of modern type.
Notes, plates, etc.	100	
Total	500	

THIRD CLASS.

Practical solid geometry, elementary	400	Ross's Practical Solid Geometry, edition 1887. Review of fourth-class course. Also Contoured Plans of Parapets, etc.
Field fortification	800	Text-Book of Fortification and Military Engineering. Part I, edition 1892. Review of fourth-class course, and as far as paragraph 133. Also lithographs, etc.
Notes, plates, etc	300	
Total	1,500	

ARTILLERY DIVISION, SECOND CLASS.

Field fortification (applied)	200	Text-book of Fortification and Military Engineering, Part I, edition 1892.
Pioneer duties (applied)		Do.
Camp duties (applied)		Regulations and Instructions for Encampments.
Coast defenses (applied)		Engineering, Part II, edition 1893.
Notes, plates, etc. (applied)	50	
Total	250	

ENGINEER DIVISION, SECOND CLASS.

Practical solid geometry (advanced), orthographic projection.	200	Ross's Practical Solid Geometry, edition 1887.
Pioneer duties	200	Text-book of Fortification and Military Engineering, Part I.
Field fortification (applied)		Do.
Camp duties		Regulations and Instructions for Encampments.
Coast defenses		Text-book of Fortification and Military Engineering, Part II, edition 1893.
Notes, plates, etc	100	
Total	500	

11. Fortifications, practical solid geometry, and military engineering—Continued.

ARTILLERY DIVISION, FIRST CLASS.

Subject.	Marks.	Treatise.
Permanent fortification Attack and defense of forts and fortresses Second-class course, review of and reexamination in.	600	Text-book of Fortification and Military Engineering, Part II, edition 1893.
Notes, plates, etc	150	
Total	750	

ENGINEER DIVISION, FIRST CLASS.

Permanent fortification Attack and defense of forts and fortresses Second-class course, review of and reexamination in, including extra paper for engineer division, covering the whole year's course.	1,200	Text-book of Fortification and Military Engineering, Part II, edition 1893.
Notes, plates, etc	300	
Total	1,500	

12. Military topography.

The marks are apportioned as follows:

FOURTH AND THIRD CLASSES.

	Fourth class.	Third class.
Notes, plates, etc	200	600
Examination, indoor	300	400
Examination, outdoor; uncontoured sketch by aid of prismatic compass and sketching case	.....	500
Total	500	1,500

Fourth-class course: Text-book of military topography; practical work indoor; practical work outdoor.
Third-class course: Text-book of military topography; practical work indoor; practical work outdoor.

SECOND AND FIRST CLASSES.

	Second class.	First class.
Notes, plates, etc	100	300
Examination, indoor	150	150
Examination, outdoor; contoured sketch by clino-compass and sketching case	.....	300
Total	250	750

Second-class course: Text-book of military topography; practical work indoor; practical work outdoor.
First-class course: Text-book of military topography; practical work indoor; practical work outdoor.

13. *French or German;* the marks allotted to each of these languages are apportioned as follows:

	Fourth class.	Third class.
Written examination:		
Writing from dictation	35	90
Translation from English	50	150
Translation into English	45	130
Grammatical questions	30	95
Composition	35	115
Oral examination:		
Conversation	30	95
Viva voce translation from English	25	75
Total	250	750
	1,000	

14. *Chemistry and physics.*

The marks are apportioned as follows:

	Fourth class.	Third class.	Second class.	First class.
Examination	500	950	450	950
Notes, examples, etc		50	50	50
Total	1,500		1,500	

FOURTH CLASS.

Subject.	Marks.	Treatise.
Theoretical chemistry and physics: (*a*) elementary chemistry and physics; (*b*) chemistry of metals.	400	Notes on chemistry, practical exercises, and (for chemistry of metals) notes of lectures.
Practical chemistry	100	
Total	500	

THIRD CLASS.

Sound, heat, light, and explosives	650	Notes on heat; notes on explosives.
Practical chemistry	300	Practical exercises on chemistry.
Notes, examples, etc	50	
Total	1,000	

15. Electricity and magnetism.

The marks are apportioned as follows:

SECOND CLASS.

Subject.	Marks.	Treatise.
Theoretical	250	Notes on electricity. Sylvanus Thomson's Electricity, for reference.
Practical	200	
Notes, examples, etc	50	
Total	500	

FIRST CLASS.

Theoretical	550	
Practical	400	
Notes, examples, etc	50	
Total	1,000	

16. Tactics (not minor tactics).

The marks are apportioned as follows:

SECOND AND FIRST CLASSES.

	Examination.
Second class	250
First class	750
Total	1,000

17. Artillery.

The marks are apportioned as follows:

SECOND AND FIRST CLASSES.

	Artillery division.		Engineer division.	
	Second class.	First class.	Second class.	First class.
Notes, plates, etc	40	160	25	75
Examination	660	1,140	225	675
Total	700	1,300	250	750

ARTILLERY DIVISION, SECOND CLASS.

Subject.	Marks.	Treatise.
Ordnance	180	Treatise on Ordnance, 1893.
Ammunition	180	Treatise on Ammunition, 1892.
Explosives	100	Handbook on Gunpowder and Gun Cotton, 1888. Notes on Cordite.
Mechanism	200	
Notes, plates, etc	40	
Total	700	

Thursday	2nd	10.0 a.m. to 11.0 a.m.	[illegible]		2nd	10.0 a.m. to 11.45 a.m.	Topography
		11.30 a.m. to 12.30 p.m.	Riding Drill.	Drill.		12.0 noon to 1.0 p.m.	Gymnastics.
	Vol.	4.0 p.m. to 5.0 p.m.	Landscape Drawing.	astics.		2.10 p.m. to 3.10 p.m.	Squad Drill.
				nape ing.		4.0 p.m. to 5.0 p.m. (compulsory)	French or German.
	3rd	5.15 p.m. to 7.15 p.m.	Electricity.	nastics.	3rd	5.15 p.m. to 7.15 p.m.	Model Drawing.
Friday	1st	8.15 a.m. to 9.45 a.m.	Artillery Exercises.	istry hysics.	1st	8.15 a.m. to 9.45 a.m.	Fortification.
	2nd	10.0 a.m. to 11.45 a.m.			2nd	10.0 a.m. to 11.45 a.m.	
		12.0 noon to 1.0 p.m.	Battalion Drill.	tion l.		12.0 noon to 1.0 p.m.	Battalion Drill or Gymnastics.
		2.30 p.m. to 3.30 p.m.	Riding Drill.	astics.		2.10 p.m. to 3.10 p.m.	Squad Drill.
					Vol.	4.0 p.m. to 5.0 p.m.	Landscape Drawing.
	3rd	5.15 p.m. to 7.15 p.m.	Tactics.	Draw. g.	3rd	5.15 p.m. to 7.15 p.m.	French or German.
Saturday	1st	8.15 a.m. to 10.15 a.m.	Electricity.	ics.	1st	8.15 a.m. to 9.45 a.m.	Military Topography
		10.45 a.m. to 11.30 a.m.	Riding Drill		2nd	10.0 a.m. to 11.30 a.m.	

17. Artillery—Continued.

ARTILLERY DIVISION, FIRST CLASS.

Subject.	Marks.	Treatise.
Ordnance	180	Treatise on Ordnance, 1893.
Ammunition	180	Treatise on Ammunition, 1895.
Military carriages	340	Treatise on Military Carriages, 1888.
Principles of gunnery	340	Text-book of Gunnery, 1887.
Organization, equipment, and employment of artillery.	100	Field, siege, and garrison artillery drill books; notes and lectures.
Notes, plates, etc	160	
Total	1,300	

ENGINEER DIVISION, SECOND CLASS.

Ordnance	125	Treatise on Ordnance, 1893.
Ammunition	100	Treatise on Ammunition, 1892.
Notes, plates, etc	25	
Total	250	

ENGINEER DIVISION, FIRST CLASS.

Ordnance	125	Treatise on Ordnance, 1893.
Ammunition	100	Treatise on Ammunition, 1892.
Military carriages	200	Treatise on Military Carriages, 1888.
Principles of gunnery	200	Text-book of Gunnery, 1887.
Organization, equipment, and employment of artillery.	50	Field, siege, and garrison artillery drill books; notes and lectures.
Notes, plates, etc	75	
Total	750	

18. *Artillery drills and exercises.*—Artillery division, second class: Field-Artillery Drill (handbook, 1893). Field-Gun Drill. Garrison Artillery, Vols. I and II, 1892. First class: Garrison Artillery, Vol. I, 1892. 9-inch R. M. L. gun drill. Garrison Artillery, Vol. II, 1892. Exercises. Siege-Artillery Drill, 1891. Exercises. Miscellaneous. Sights and range and position finders.

Engineer division, second class: Field-Artillery Drill, 1889. Field-Gun Drill. Garrison Artillery Drill, Vol. I. Laying ordnance. 9-inch R. M. L. gun drill. Garrison-Artillery Drill, Vol. II. Exercises. First-class: Garrison-Artillery Drill, Vol. II. Exercises. Siege-Artillery Drill, 1891. Exercises. Laying. 6.6-inch R. M. L. gun drill. Miscellaneous. Scott's sight and depression range finder.

19. *Military organization.*—The cadets are organized into one large company, under the direct command of the assistant commandant and secretary. This company is subdivided into three divisions, each of which is under a lieutenant of the army. The noncommissioned officers are appointed from the cadets. There is one senior underofficer appointed from the first class, who is senior in rank to all the other cadets at the academy. There are also three divisional underofficers appointed from the first class, one for each division.

The other noncommissioned officers are of the grade of corporal. They are selected, as a rule, from the first class. All the cadet noncommissioned officers are selected for their general fitness.

Their appointments are made by the governor, upon the recommendation of the assistant commandant. They enjoy certain privileges not usually granted to the other cadets and have an increased allowance of pocket money. They may be reduced to the ranks for neglect of duty. misconduct, or incapacity, with such additional punishment as the governor may impose. Cadets reduced to the ranks for unfitness are not to be recommended for commissions in the army unless they obtain reinstatement at least to the rank of corporal before graduation.

The establishment reported at the last inspection by the board of visitors, in June, 1895, was 208 cadets, including 1 Queen's cadet. The spring term of 1896 commenced with but 176 cadets, As for a number of years more cadets have been graduated than there were vacancies available, a majority and sometimes all of the class have been obliged to wait several months or a year before receiving commissions in the army. The policy will probably be to admit fewer cadets each year, so that the number graduated may be at once provided for in the artillery and engineers.

20. *Pay and terms of payment.*—The terms of payment for cadets are regulated by the articles of the royal warrant for pay, etc.

The amount to be contributed on behalf of a cadet at the Royal Military Academy shall depend upon the position held by his father. The amounts are payable half-yearly in advance.

The half-yearly contributions range from £150 for the son of a private gentleman and £80 for the son of a general or admiral down to £40 for the son of an officer below the rank of lieutenant-colonel in the army or commander in the navy, the minimum contribution being £20 for the son of a deceased officer whose family has been left in pecuniary distress.

Pay at the rate of 3 shillings a day shall be credited to a cadet to cover the expenses of regimental clothing, messing, washing, and other contingencies. All other necessary expenses which can not be covered by his pay shall be chargeable to his parent or guardian in addition to the regulated contribution.

Among their necessary expenses must be included pocket money, which is issued weekly and charged in the cadets' accounts according to the following scale:

	Shillings.
Senior underofficer	5
Divisional underofficer	4
Corporal	3
Cadet	2

If a cadet be rusticated or removed[1] during a term, his daily pay shall cease from the date of such rustication or removal, and the contribution made for the half year shall be forfeited.

Each cadet, other than a Queen's cadet,[2] on first joining, will be required to pay, in addition to the regulated contribution, a sum of £25 toward covering the expense of uniform, books, etc., and to bring with him the articles of clothing of which he will receive notice, and which must afterwards be kept up at his own expense. In addition to the half-yearly contribution in advance, he must also deposit £5 for contingent expenses, which sum he will be required to make up on returning to the academy after each vacation, toward covering any expense that may be incurred on his account during the ensuing half year.

II.—THE ROYAL MILITARY COLLEGE.

1. The Royal Military College is maintained for the purpose of affording a special military education to candidates for commissions in the infantry and cavalry. Candidates must, in the opinion of the commander in chief, be in all respects suitable to hold commissions in the army.

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[1] Removal or expulsion prevents admission into any branch of Her Majesty's service.

[2] A Queen's cadet has no contribution to pay and no admission fee. A Queens cadet at Woolwich must enter by competitive examination, having no advantage in this respect over the other candidates. At Sandhurst, however, a Queen's cadet has to pass a qualifying examination only. There was only one Queen's cadet at Woolwich on the 24th of June, 1895, the date of the last inspection by the board of visitors.

The commander in chief is the president of the Royal Military College.

An independent inspection will be made annually by a board of visitors, appointed by the secretary of state for war and reporting to him. The report of this board will be presented to Parliament.

The college will be under the control of a military officer, styled "governor and commandant," appointed by and responsible to the secretary of state for war through the commander in chief.

The governor will be assisted by a staff officer, styled "assistant commandant and secretary," who will command the cadet battalion and have the custody of the records and correspondence of the college.

The organization will be on a military basis.

The governor will be assisted in the arrangement of the studies by a board composed of the assistant commandant and the professors or senior instructors of the different branches. The head of each branch will have the supervision and inspection of the studies in his department, and will report on them to the governor.

2. *Regulations for admission.*—Admission to the Royal Military College will be granted (*a*) to successful candidates at a competitive examination; (*b*) to Queen's cadets, honorary Queen's cadets, Indian cadets, and pages of honor, subject to a qualifying examination.

The other requirements under the head of "regulations for admission" are the same as those set forth for Woolwich under the same head, with the following exceptions and additions:

The dates of admission will be the 10th of February and the 1st of September in each year.

The limits of age for admission to the college will be from 17 to 19. Competitors who desire to obtain commissions in the West India regiment may be admitted up to the age of 22 until July, 1894, and up to that of 21 after July, 1894.

3. *Examinations.*—The regulations under this head are the same as those comprised under the same subject, paragraph 3, of the Woolwich examinations.

4. *Subjects of examinations.*—The subjects of the examination and the maximum number of marks obtainable for each subject will be as follows:

CLASS I.

(1) Mathematics: (*a*) Arithmetic, including vulgar and decimal fractions, proportion, and simple interest, 3,000 marks; (*b*) algebra, up to and including the binomial theorem, the theory and use of logarithms, 3,000 marks; (*c*) Euclid, Books I to IV and VI, 3,000 marks; (*d*) plane trigonometry, up to and including solution of triangles and mensuration, 3,000 marks.

(2) Latin, 2,000 marks.

(3) French or German (200 for colloquial), 2,000 marks.

(4) English composition, including spelling and handwriting, 1,000 marks.

(5) Drawing, geometrical, 1,000 marks.

Candidates who have not previously to the 1st of January, 1894, passed the army preliminary or other examinations which have been accepted as equivalent thereto, will be required to qualify in arithmetic, and must also obtain such an aggregate of marks in the subjects in Class I as may satisfy the civil service commission.

CLASS II.

(1) Higher mathematics: (In all the following subjects great importance will be attached to accuracy in numerical results.)—Further questions and problems on the subjects of the obligatory examination, 2,000 marks. Statics: The equilibrium of forces acting in one plane and of parallel forces, the center of gravity, the mechanical powers and friction (the graphical or geometrical method of treating such problems should be studied as well as the analytical; no application of the differential calculus to statics will be required), 2,000 marks. Dynamics: Uniform, uniformly accelerated, and uniform circular motion, falling bodies and projectiles in vacuo, collisions and work (analytical methods of solution, but not the use of the differential calculus will be involved), 2,000 marks. Analytical geometry: Problems on straight line and circle, 2,000 marks. Conic sections: Elementary properties, with easy problems both on the analytical and geometrical methods.

(2) German or French, as alternating with subject 3, of Class I (200 for colloquial), 2,000 marks.
(3) Greek, 2,000 marks.
(4) English history: There will be set, one general paper, one paper limited to a fixed period, of which notice will be given, 2,000 marks.
(5) Chemistry: Elements of inorganic chemistry, 2,000 marks.
(6) Physics: Elementary properties of electricity, magnetism, heat, light, and sound, 2,000 marks.
(7) Physiography and geology, 2,000 marks.

In each of the subjects (5), (6), and (7), the examinations will be partly practical. Only two of the subjects in Class II can be taken up.

CLASS III.

(1) Geography, 500 marks.
(2) Drawing, freehand, 500 marks.

Both these subjects may be taken up.

5. The number of marks allowed to each candidate in the several subjects in which he has been examined will be summed up, and the resulting total will determine the place of the candidate in the competitive list, the successful candidates being those who stand at the head of the list up to the number of cadetships competed for.

(*a*) At the examination held June 26, 1895, the number of cadetships to be awarded was 101, of which 83 were for the infantry, 14 for the cavalry, and 4 for the West India regiment. These numbers, however, were subject to reduction according to the number of cadetships awarded under paragraph (*c*). Intending competitors are always to inform the military secretary before the date fixed for the examination whether they elect to be considered candidates for cavalry or infantry. They may return their names (1) for cavalry only; (2) for infantry only; or (3) for cavalry or infantry (infantry preferred); and must, in addition, state whether they would prefer appointment to the Indian staff corps. Cadetships will be given to successful candidates, subject to the above limitation of numbers, in order of merit, in accordance with the election they have made. Candidates electing under (3), with the exception of those noted for appointment to foot guards, will not be brought forward to the successful cavalry list while there are candidates electing under (1) to be provided for. Candidates must distinctly understand that the election made by them before the examination will be absolutely final. and that it can not be altered after the result of the examination has been declared.

(*b*) The West India cadetships were awarded in the same manner as heretofore. The number of competitors is usually small, and as the candidates are generally above the regular age of admission to Sandhurst, they can go in for the West India regiment only.

(*c*) Thirty-five cadetships, with a view to commissions in the Indian staff corps, were awarded to candidates who qualified. Competitors must, when notifying their preference for the cavalry or infantry, as above, state whether they wish in addition to be considered candidates for the Indian staff corps. All Queen's cadets (British and Indian) and honorary Queen's cadets nominated by the secretary of state for India in council have the option of electing whether they will join the military college for appointment to the staff corps or for commissions in British cavalry or infantry. The cadetships remaining after the claims of the Queen's cadets and honorary Queen's cadets (Indian) have been satisfied are allotted in order of merit to successful candidates other than candidates for the West India regiment who have elected for the Indian staff corps.

(*d*) The total number of vacancies each half year at Sandhurst is 120, and as there are three classes or "educational divisions," the total establishment is 360. Supernumerary cadets are, however, admitted. The number of supernumeraries at the date of the last inspection of the board of visitors, June, 1895, was 5.

6. *Queen's cadets, honorary Queen's cadets, Indian cadets, and pages of honor.*—A limited number of the sons of officers, who have earned the privilege by service of a specified nature, are

appointed Queen's or honorary Queen's cadets, or Queen's India or honorary Queen's India cadets, and are admitted to Sandhurst on passing a qualifying examination only. The number of admissions of this class is about 18 every half year.

Pages of honor, youths who have served in the household of the Queen, may also be admitted to Sandhurst, being admitted in the same manner as Queen's cadets.

Queen's cadets will be granted an educational allowance of £40 a year, tenable between the ages of 13 and 17, and they are exempt from the payment of any contribution while at Sandhurst.

With regard to Queen's cadets, the director-general of military education remarks as follows:

> The object of giving a money allowance from the age of 13 is to enable the cadet to obtain an education which his mother's means would not otherwise enable her to secure for him. Instead of this it becomes a guaranty for his entering Sandhurst without that education. To give money for education and then to admit on a low qualification seems to me to be illogical.

Queen's India cadets are also exempt from payment at Sandhurst.

The total number of cadets at each rate of contribution at Sandhurst at the time of the inspection by the board of visitors in June, 1895, was as follows:

Who do not pay contribution:		At £70 per annum	8
Queen's cadets	10	At £80 per annum	3
India cadets	16	At £150 per annum	202
At £20 per annum	3	Total	365
At £40 per annum	42		
At £60 per annum	81		

7. *Pay and terms of payment.*—The pay of cadets and the terms of payment at Sandhurst are the same as are prescribed for Woolwich, with the exception noted for the privileged cadets.

8. *Time-table, June, 1895.*—The examinations covered the time from the 26th of June to the 6th of July, inclusive, the hours of attendance and the intermission in the middle of the day being practically the same as for the Woolwich examination.

The rules for the conduct of the examination quoted under paragraph 5, Woolwich, note, apply also to the Sandhurst examination.

TABLE A.—*Extract from table of marks—Competition for admission to the Royal Military College, Sandhurst, June, 1895.*

I.—CANDIDATES SUCCESSFUL FOR CAVALRY CADETSHIPS (14).

Number in order of merit.	Number in examination.	Name.	Class I (obligatory).							Class II (any two may be taken up).								Class III.		Total.
			Mathematics.	Latin.	Alternative. French.	Alternative. German.	English composition, including spelling and writing.	Geometrical drawing.	Total, Class I.	Higher mathematics.	Alternative. German.	Alternative. French.	Greek.	English history.	Chemistry.	Physics.	Physiography and geology.	Geography.	Free-hand drawing.	
		Maximum	3,000	2,000	2,000	2,000	1,000	1,000	9,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	500	500	14,000
25	708	Blackett, R	1,576	1,716	1,120	.....	567	475	5,454	.....	1,252	.....	1,457	.....	.....	.....	.....	402	312	8,877
*	*	* * * *	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
134	514	MacLeay, St. C. A. J.	1,254	1,383	1,114	.....	434	870	5,055	.....	1,060	.....	.....	.....	627	.....	.....	349	273	7,364

II.—CANDIDATES SUCCESSFUL FOR INFANTRY CADETSHIPS (83).

1	701	Withers, C. M.....	2,414	1,225	1,310	.....	614	930	6,493	.....	1,313	.....	.....	.....	.....	1,560	.....	390	255	10,011
*	*	* * *																		
93	899	Hawley, W. G. B. I.	1,301	1,307	1,213	.....	702	405	4,928	.....	1,340	.....	.....	.....	783	.....	.....	318	452	7,821

III.—QUEEN'S CADETS, AND QUEEN'S INDIA CADETS QUALIFIED (3).

[The highest with a total of 7,225, the lowest with a total of 4,551.]

The total number of candidates was about 900. Of the unsuccessful candidates 246 qualified, and consequently were eligible for admission to the college if subsequently appointed Queen's cadets. Thirty-three of the unsuccessful qualified candidates passed higher than the lowest successful cavalry candidate, but as these 33 put down their names for infantry only, or infantry preferred, they got no places at all. The highest of the unsuccessful candidates who qualified had a total of 7,783; the lowest, a total of 4,303.

9. *Synopsis of the course of instruction, etc.*—The length of the course of instruction will be eighteen months, divided into three terms or classes of six months each. The classes are known as seniors, intermediates, and juniors.

The college terms will be—

First term: From the Wednesday of the week in which the 27th of January falls to the 27th of June, with a vacation of eleven days at Easter.

Second term: From the Wednesday of the week in which the 16th of August falls to the 21st of December.

The intermediate periods will constitute the vacations.

10. The following subjects will form the ordinary course of obligatory studies:

Course of instruction.	Marks.		
	Senior division.	Intermediate division.	Junior division.
Military administration	300	300	300
Military law	300	300	300
Tactics and musketry	[1]600	300	300
Military history and geography	150	150	nil.
Fortification	[2]900	300	300
Military topography	[3]800	300	300
Drill	200	nil.	nil.
Riding	200	nil.	nil.
Gymnastics	200	nil.	nil.
Aggregate	3,650	1,650	1,500

[1] Including 150 for tactical schemes and 150 for musketry.
[2] Including 300 for plates, sketches, etc.
[3] Including 200 for plates, sketches, etc.

Fifty marks will be given toward the aggregate of each of the underofficers as a reward for their services if recommended by the governor. The text-books used are the following:

Fortifications, including artillery: Phillips's Fortification; Manual of Military Engineering.
Military topography: Richards.
Military law: Queen's Regulations; Manual of Military Law; Morrison's Text-book.
Tactics and musketry: Clery's Tactical Text-book; Musketry Instruction, 1896.
Military administration: Queen's Regulations; Manual of Military Law; Pay Warrant; Morrison's Text-book (Notes on Military Law, Organization, and Interior Economy).
Drill: Infantry Drill, 1893; Cavalry Drill, 1896; Rifle Exercises, Lee-Metford, 1892; Musketry Instruction, Lee-Metford, 1896; Sword Exercises.
Gymnastics: As laid down in the regulations.
Riding: As laid down in the cavalry drill.

There are some voluntary subjects of instruction mostly practical, such as ambulance and stretcher drill, first aid, etc.; range finding; signaling.

11. *Examinations.*—There will be examinations at the end of each term, conducted by independent examiners. Some questions will be set on the work done in previous terms. Failure to pass involves a warning that a subsequent failure will result in removal from the college. No cadet will be permitted to reside for more than three terms at the college except in case of protracted illness.

Cadets of the senior division who have completed their course satisfactorily, if reported to be duly qualified in all respects, will be eligible as vacancies occur and will be gazetted to regiments as second lieutenants, as far as possible in their order of merit.

Candidates for commissions will be permitted to express a general preference for home, colonies, or India, but must understand that in the interests of the service they will be required to fill any vacancies, wherever available, irrespectively of such preference.

In cases where a special claim on any particular regiment may exist, any fully qualified candidate may make application accordingly to the military secretary, and, should the same be approved, he will be permitted to wait for a vacancy in such regiment, for a period not exceeding twelve months, being liable, in consequence of such waiting, to a loss of seniority in the army.

The qualifying minimum at the several examinations is one-half of the aggregate marks and one-third of the examiner's marks in each subject, except in riding and gymnastics, in which a counting minimum of one-third will be required.

Cadets who obtain 0.75 of the marks at the final examination will be recorded as having passed with honors.

A cadet will be removed from the Royal Military College on the following grounds:

(*a*) If he fails to pass at two consecutive examinations.

(*b*) If he fails to acquire a sufficient proficiency in military exercises, viz, drill, gymnastics, and riding.

No exception to the above rule will be allowed on account of absence from any cause excepting illness; cases of protracted absence on account of illness will be specially referred for decision to the secretary of state for war through the commander in chief.

A cadet who fails to pass the examination at the end of his third term of residence will not be permitted to return to the Royal Military College, but will be allowed to be examined at the next ensuing examination if specially recommended by the governor. A failure at this examination will disqualify a cadet for a commission in the army, and his name will be at once removed from the books.

Prizes will be given at the final examination for proficiency in each subject.

A sword will be given at each final examination as a special reward to the most deserving cadet of his term.

12. The following time-table, in force in the spring of 1895, will give an idea of the employment of time in summer and winter. The time-table is subject to frequent changes, though generally the variations are slight:

TABLE B.—*Summer time-table.*

Studies, exercises, etc.	Sunday.	Monday.	Tuesday, Thursday, and Friday.	Wednesday.	Saturday.
Rouse	8 a. m	5.45 a. m.	5.45 a. m.	5.45 a. m.	5.45 a. m.
Drill, riding, and physical training.		6.10 to 7.10 a. m.	6.15 to 7.15 a. m.	6.15 to 7.15 a. m.	
Commandant's parade					6.15 to 7.15 a. m.
First study, physical training		7.20 to 8.20 a. m.	7.20 to 8.20 a. m.	7.20 to 8.20 a. m.	7.20 to 8.20 a. m.
Breakfast	9 a. m	8.20 a. m.	8.20 a. m.	8.20 a. m.	8.20 a. m.
Hospital attendance	9.30 a. m.	8.30 a. m.	8.30 a. m.	8.30 a. m.	8.30 a. m.
Drill and riding		9 to 10 a. m.	9 to 10 a. m.		9 to 10.30 a. m.
Divine-service parade	10.30 a. m.				
Extra drill, riding, or gymnastics				2 to 3 p. m.	11.30 a. m. to 12.30 p. m.
Second study		10.15 a. m. to 2.15 p. m.	10.15 a. m. to 2.15 p. m.	9 a. m. to 1 p. m.	

TABLE B.—*Summer time-table*—Continued.

Studies, exercises, etc.	Sunday.	Monday.	Tuesday, Thursday, and Friday.	Wednesday.	Saturday.
Luncheon	1 p. m	2.15 p. m	2.15 p. m	1 p. m	1 p. m.
Riding and gymnastics		3.15 to 4.15 p. m.	3.15 to 4.15 p. m.		
Riding		4.15 to 5.15 p. m.	4.15 to 5.15 p. m.		
Restriction and stoppage of leave, roll call.	5 p. m				5 p. m.
Sword drill		6.15 to 7.15 p. m.	6.15 to 7.15 p. m.		
Mess	8 p. m	7.45 p. m	7.45 p. m	7.45 p. m	8 p. m.
First post	9.15 p. m	9.15 p. m	9.15 p. m	9.15 p. m	9.15 p. m.
Last post	9.45 p. m	9.45 p. m	9.45 p. m	9.45 p. m	9.45 p. m.
Lights out	11 p. m	10 p. m	10 p. m	10 p. m	10 p. m.

Winter time-table.

Studies, exercises, etc.	Sunday.	Monday, Tuesday, Thursday, Friday.	Wednesday.	Saturday.
Rouse	8 a. m	6.30 a. m	6.30 a. m	6.30 a. m.
First study, riding or physical training.		7 to 8 a. m	7 to 8 a. m	7 to 8 a. m.
Breakfast	9 a. m	8 a. m	8 a. m	8 a. m.
Hospital attendance	9.30 a. m	8.30 a. m	8.30 a. m	8.30 a. m.
Parade, riding, and gymnastics		9 to 10 a. m	9 to 10 a. m	
Commandant's parade				9 to 10.30 a. m.
Second study		10.15 a. m to 1.45 p. m.	10.15 a. m. to 1.45 p. m.	
Divine-service parade	10.30 a. m			
Extra drill, riding, and gymnastics			2.30 to 3.30 p. m	12 m. to 1 p. m.
Extra study				12 m. to 1 p. m.
Luncheon	1 p. m	1.45 p. m	1.45 p. m	1 p. m.
Parade, riding, and sword drill		4.15 to 5.15 p. m		
Gymnastics		5.15 to 6.15 p. m		
Restriction drill or roll call	5 and 9.30 p. m.		Drill, 3 to 4 p. m.	Drill, 12 m. and 3 to 4 p. m.; roll call, 5 p. m.
Stoppage of leave roll call	5 p. m			5 p. m.
Private study:				
First and second divisions		6 to 7.15 p. m		
Third division		6.30 to 7.15 p. m		
Gymnastics		6.15 to 7.15 p. m		
Mess	8 p. m	7.45 p. m	7.45 p. m	9.30 p. m.
First post	10.15 p. m	9.45 p. m	9.45 p. m	10.15 p. m.
Last post	10.45 p. m	10.15 p. m	10.15 p. m	10.45 p. m.
Lights out	11 p. m	10.30 p. m	10.30 p. m	11 p. m.

13. *Military organization.*—The military organization of the college has already been briefly indicated.[1] Each of the cadet companies into which the corps of cadets is divided for the purposes of parade, messing, and quarters is under the command of an officer of the army, detailed from the instructional staff of the institution. The noncommissioned officers are detailed from the

[1] See note to Table C.

cadets. For each cadet company there are appointed one underofficer, two senior corporals, and four corporals. Underofficers and corporals take seniority among themselves by date of appointment or as fixed in college orders. They are not liable to minor punishments other than "reprimand," but may be deprived of their appointments, or be reduced to a lower grade, in addition to other punishment by the governor.

The assistant commandant, who corresponds very nearly to the commandant of cadets at West Point, has command of the cadet battalion, and has charge, under the governor, of the discipline of the cadets. His duty is to direct personally the instruction of the cadets in all drills and military exercises. He prepares and issues all necessary daily orders, and is responsible for the duty rosters.

14. The headwork or intellectual work at Sandhurst takes up only about four hours each day, but the time of the cadets is taken up in some way or another from 7 in the morning until about 5 in the afternoon for four days of the week, and from 7 a. m. to 1 p. m. on two days of the week. The afternoons on which there are no military exercises or studies are Saturday and Wednesday, and cadets who are not under restriction are generally given leave from Saturday noon to Monday morning.

Although the course is nominally eighteen months, the breaks due to the Saturday and Sunday holidays, the summer and other vacations, reduce the actual academic work in the year from twelve months to less than eight.

Compared with the Royal Military Academy, the Sandhurst vacations were formerly considerably longer. The board of visitors of 1894 called attention to the fact that the vacations at Woolwich and Sandhurst were of different lengths and at different seasons of the year. They recommended that the vacations at the two institutions should be at the same periods, and that they should coincide, if possible, with those of other educational institutions. Accordingly, in 1895, the vacations at Sandhurst were reduced to the same length as those at Woolwich, and the board for 1895 reported that the vacations for 1896 will be as nearly as possible coincident.

The working of the classes at Sandhurst is seriously affected by having two kinds of cadets at the institution, i. e., the competitive cadets and the Queen's cadets. The Queen's cadets find themselves side by side with youths who are more advanced than themselves, so that there is a tendency to delay the instruction of the abler cadets, or to hurry over it with the privileged cadets. As might be expected, the proportion of the Queen's cadets who fail to pass their examinations is greater than that of the competitive cadets. The professor of fortification at Sandhurst reported on the 28th of November, 1893, "that out of the 12 cadets who failed to qualify at the first term examination for removal from the third division to the second division, 7 were Queen's or honorary Queen's cadets, i. e., 58 per cent." Yet the Queen's cadets only form about 15 per cent of the total strength of the division.

The director-general of military education in his report for 1893 gives the following figures:

From June, 1889, to December, 1891, the whole number of cadets who passed the final examinations was 1,012, of whom 891 entered by competitive examination and 121 by qualifying examination. The number who failed at the final examinations during the same period was 22, of whom 13 entered by competitive examination and 9 by qualifying examination.

GENERAL REMARKS ON THE TWO INSTITUTIONS.

The characteristic features of the Woolwich and Sandhurst schools are the brief period of instruction and the somewhat exacting competitive standards for admission; the two occupying to a considerable extent the relation of cause and effect, and some diversity of judgment is expressed as to their expediency. On the one hand it is asserted that too prolonged a course would tend to discourage young men of the class from which the supply of officers in England is naturally drawn from undertaking an arduous training following the years spent under tuition at

	3	Drill	—	—	Revision.	3	
Friday,	1 2 3	A. B. C. and D.—Drill. E. and F.—Riding. A. B. C. and D.—Drill. E. and F.—Gymnastics. Drill.	C. and D.	E. and F.	Revision. Military Topography. Notes II. to be completed and handed in 3rd July.	1 2 3	Friday,

Day.	Educational Division.	Drill, Riding, and Physical Training, 6.30 to 7.30 A.M.
Saturday,	1 2 3	A. B. E. and F.—Drill. C. and D. Riding. A. B. E. and F. Drill. C. and D. Gymnastics. Drill.

the public schools, particularly in view of the fact that the army as a profession is not paid enough to be self-supporting, and not all who enter it can be sure even of continued employment on full pay. An alternative proposed is to raise the standard of admission and thereby take advantage of the competition, to counteract the brevity of instruction later, and at the same time to supply a means of pretty thoroughly sifting the material at the outset.

On the other hand, it is contended that mere academic proficiency is not by any means the surest test of those qualities which go to make a soldier, however desirable as an auxiliary, and that a period of training sufficiently long to develop and modify individual characteristics and to saturate the pupil with the traditions and essential requirements of the military service is needed both to impart the requisite technical knowledge and military instinct, and in particular to inculcate habits of discipline that are essential and that can not be required if the period of tutelage is too short.

In the case of Sandhurst, the course of instruction has within the last few years been lengthened from one year to eighteen months, so that a demand for a still further lengthening of the course would probably meet strong opposition. With regard to Woolwich, it is very generally conceded that the course of instruction is too short, or, as the boards of visitors of 1893 and 1894 express it, "That no amount of instruction that can be given during the two years which cadets now pass at the academy can by any possibility be considered adequate for the completion of the instruction of officers of artillery any more than it can be for that of officers of engineers."

An additional argument for longer courses of instruction is found in the fact that, especially in the case of Woolwich, the army vacancies are fewer than the graduates, and thus the young men are kept waiting without occupation or pay for prolonged periods after completing the course. Of the graduates from Woolwich, for example, of March, 1894, the greater number were still unprovided for in March, 1895.[1]

It is evident that such an intervening stage of idleness and freedom from restraint is highly disadvantageous to the individual at the age of graduation.

The matter has been brought before Parliament, and the secretary of state for war has agreed that provision should be made for continuing instruction and supervision until commissions are given and the young officers ordered to duty.

FRANCE.

The schools which correspond most nearly to the United States Military Academy are the École Polytechnique, at Paris, and the École Spéciale Militaire, at St. Cyr, or St. Cyr, as it is popularly designated.

I.—L'École Polytechnique, or the Polytechnic School.

This school is at Paris and was founded in 1794. It has been reorganized by various decrees, the latest of which was dated March 13, 1894.

The object of the school is to train students for the following branches of the public service, viz: The artillery of the army and the marine artillery; the engineer corps of the army (génie militaire); the engineer corps of the navy or naval constructors (génie maritime); the corps of naval officers; the hydrographic corps; the marine commissariat corps; the corps of highways and bridges (ponts et chaussées); the manufactories of the State; the engineers of the powder and saltpeter service; the mining engineers, and the telegraphic lines; also for such other public services as require a profound knowledge of the mathematical, physical, and chemical sciences.

Admittance to the school is exclusively by competitive examination. After a two years' course the student may go to one of the special schools of application for any of the above-

[1] This applies more particularly to cadets recommended for the royal artillery.

mentioned services, provided he can pass successfully the final examinations and be declared to be acceptable for this service by the decision of a committee which draws up the classification list for the public services.

Fulfillment of these conditions does not give an absolute right to enter any of the public services; admission to any service depends upon the number of vacancies existing at the time of leaving the school, upon the physical aptitude of the student, and his place on the order of merit.

The polytechnic school is subject to military discipline and is directly subject to the minister of war.

The number of students to be admitted is fixed every year by the minister of war. In 1894 the number was fixed at 210. The admission depends partly upon the capacity of the school buildings and partly upon the prospective number of vacancies, although the minister is authorized to admit one-tenth more than the number necessary to fill vacancies that will presumably occur.

The cost of board (pension) is 1,000 francs per year. The cost of the outfit is fixed every year by the minister. A deposit of 100 francs in addition is required on entering to constitute the student's individual fund (masse).

Full or half bursars are appointed from those whose family financial circumstances require such concessions. These are required to bind themselves to serve the State for ten years, unless they reimburse the treasury the cost of their respective bursarships. On graduating into the artillery or engineers each bursar cadet receives the cost of a first outfit.

The competition for admission to the Polytechnic is public, and takes place every year in Paris and in certain cities designated by the minister of war.

All candidates must be French born or naturalized, must have been vaccinated or have had the smallpox, and must be between the limits of 17 and 21 years of age on the 1st of January of the year of the competition. Temporarily, soldiers who have served six months with the colors are eligible up to the age of 25.

Candidates must enter their names by the 1st of April at the latest, either at the prefecture of the department where they are studying, if they are civilians, or, if they are soldiers, at the prefecture of the department where they are garrisoned. Only the students of the Prytanée Militaire are exempt from the requirement of entering their names.

Before they are allowed to enter their names, candidates must produce the following papers:

(1) The legally attested birth certificates of the candidate and his father.

(2) Proof that the candidate possesses one of the following diplomas: Bachelier ès sciences, or bachelier de l'enseignement secondaire spécial ou moderne. Certificates that the candidate has passed the first examination for the baccalaureate are also admitted in lieu of the diplomas above mentioned.

(3) A certificate of physical aptitude.

(4) A declaration of the place where he wishes to be examined.

(5) A declaration from the father of the candidate with regard to the payment of the board (pension) for his son, or an application for a bursarship or demibursarship.

Every candidate who succeeds in obtaining an appointment to the school and who does not report to the commandant of the school within the time fixed by the letter of appointment will be considered as having resigned.

On arriving at the school every appointee will be subjected to a medical examination, and all those who are found fit for military service are required to sign an engagement to serve three years from October 1 in the army. The two years' service at the school is credited to the scholar, but in case a scholar fails in his studies, or is dismissed for misconduct, he is required to serve out his full term of three years as a soldier in some line regiment.

For certain reasons, such as failure in health or on account of injury, scholars may be turned back for one year, but not more than once, and this year does not count as a credit against the three years' engagement.

By article 15 of the new decree, a certain number of foreigners may be permitted by the minister of war to follow the course as externals, provided their aptitude has been established by means of a special examination, but no such foreigner may be admitted as a resident scholar.

The scholars live in barracks, and are divided into four companies for purposes of discipline and military instruction; for academic purposes they are classed into two divisions, corresponding to the years of the course. Twice a year the standing of each scholar is published by bulletin. At the end of the school year an examination fixes the relative order of merit in each division, and the average of the results of the final examinations of both years fixes the order of merit of the graduating class. The scholars of the graduating class select the public service which they wish to enter before they go up for the final examination, and they also declare their secondary selections. If they decide not to enter any of the public services, they so declare, and are then sent, equally with those who have selected a civil position in the public service, to serve one year in the reserve of the army as second lieutenants. They must all fulfill the three years of service for which they contracted on entering the school.

If, for any reason, any scholar should not accept the place in the public service assigned to him, or if his graduating standing should not have obtained for him a vacancy in some of the services supplied by the polytechnic school, he may be appointed a second lieutenant in some part of the army or navy not specified in the list of services supplied by the school, or may be sent to the school of forestry, or to one of the schools of application for the civil service.

Those who graduate in the artillery and engineers of the army and the marine artillery are sent, as elèves sous lieutenants (student second lieutenants), to take a post-graduate course at the school of application for the artillery and engineers at Fontainebleau (formerly Metz).

Of the graduates of 1894, who went into the army or marine, 76 entered the artillery of the army, 24 the marine artillery, 10 the marine engineers (naval constructors), 1 became a hydrographer of the navy, and 21 went into the engineer corps of the army.

The polytechnic school, though under the minister of war, is much more of a scientific school than a military one. A diploma from this school is considered invaluable for any scientific career.

ENTRANCE EXAMINATIONS.

The competition is divided into three successive examinations: First, the "compositions" or written papers; second, the preliminary examinations or examinations of the first degree (oral), and, third, the examinations of the second degree (oral).

Papers (*"compositions"*).—These include a paper on the course of special mathematics, a problem in descriptive geometry, a paper on the French language, a paper on physics and chemistry, a trigonometrical problem, a pen-and-ink (or india-ink) drawing, and a drawing of a bust from a plaster cast.

All the papers are corrected and marked. When the marks allotted to any paper, multiplied by the proper coefficient, amount to less than the sum fixed by the examining board, the candidate is not allowed to enter the examinations of the first degree.

EXAMINATION OF THE FIRST DEGREE.

The oral examinations of the first degree are held on the subjects specified in the programme of admission, and serve, in connection with the mathematical papers and the papers in chemistry and physics, to exclude from the oral examinations of the second degree such candidates as are insufficiently prepared.

To accomplish this result, the mean of the marks of the two examinations will be multiplied by 10; to this will be added the mark of the physical and chemical paper multiplied by 2, and the mark on the mathematical paper. When the sum of the points thus obtained is less than the minimum fixed by the examining board, the candidate will be eliminated.

EXAMINATION OF THE SECOND DEGREE.

The oral examinations of the first degree serve, in connection with the papers and the oral examinations of the second degree, to determine the classification in order of merit.

	Coefficients.
Oral examinations of the first degree	10
Mathematical paper	1
Physical and chemical paper	2
For final admission:	
Mean of the two oral examinations of first degree	18
Examinations of the second degree:	
Mathematics—	
First examiner	20
Second examiner	20
Physics	10
Chemistry	5
German	5
Papers:	
Mathematics	4
Descriptive geometry	3
Trigonometrical problem	1
Drawing	4
Pen-and-ink sketching	1
French	6

The marks on the different papers and examinations range from 0 to 20.

Any candidate who obtains in any subject a mark less than 5 shall be reported to the board and may be excluded for insufficient preparation, and any candidate who turns in, in any subject, a blank sheet will not be allowed to enter the oral examinations.

PROGRAMME OF SUBJECTS OF EXAMINATIONS (1895).

The examiners are always allowed to satisfy themselves that the candidates are properly grounded in the elementary mathematics (arithmetic, geometry, and algebra).

(1) Algebra: Through the higher algebra.

(2) Trigonometry: Through plane and spherical trigonometry.

(3) Analytical geometry: Analytical geometry of two and three dimensions.

(4) Mechanics: Cinematics, dynamics, and statics.

(5) Descriptive geometry: As far as the intersection of conical or cylindrical surfaces or the intersections of surfaces of revolution whose axes intersect.

(6) Physics: Optics, measuring instruments, such as verniers, micrometers, and spherometers; weight, laws of falling bodies, etc.; hydrostatics, statics of gases; heat, calorometry; changes of state, such as fusion, solidification, and surfusion; hygrometry.

(7) Chemistry: Organic and inorganic.

(8) French language: A composition of the same style as those prescribed by the programmes of the class of philosophy.

(9) German language: The principal rules of grammar; translating at sight; answering in German questions addressed to them in that language, etc.

(10) Geometrical drawing, drawings in india ink, and copies: Candidates must execute a problem in descriptive geometry, an india-ink drawing, and a copy from a plaster cast, in pencil.

(11) Problems and drawings to be handed to the examiners: Candidates must turn in to the examiners a number of descriptive geometry problems, and drawings in pencil and india ink, executed by themselves during the current scholastic year. This work must be properly attested, so as to make sure that the drawings presented are really the work of the candidates in question. Attempts at deception with regard to these matters will rule out a candidate from further competition.

FURTHER REGULATIONS.

An advantage of 15 points will be granted to those candidates who produce the diploma of bachelier ès lettres, or a certificate that the candidate has passed the first examinations for this baccalaureate degree.

An advantage of from 1 to 5 points is granted to those candidates who show themselves proficient in some living language other than German.

A number of points, varying from 1 to 15, will be allowed the candidates for their aptitude in physical exercises (fencing, gymnastics, and riding). Candidates are not admitted to the examination of the second degree unless they can present a certificate from the physical examining board to the effect that they have passed the tests required by this board.

All the subjects included in the programme are equally obligatory. Candidates whose information on any of the subjects of examination is deemed to be insufficient are to be struck from the list, whatever may be the rank they occupy in the order of merit.

COURSE OF INSTRUCTION.

The course comprises the following branches: Analysis (the higher branches of analysis), mechanics and machines, descriptive geometry and stereotomy, physics, chemistry, astronomy, architecture, history and literature, drawing, including drawing of machinery, and German.

There is also a department of military instruction, presided over by a chef d'escadron of artillery.

No list of text-books is available at present.

II.—L'ÉCOLE SPÉCIALE MILITAIRE À ST. CYR.

The special military school of St. Cyr, or St. Cyr, as it is popularly designated, dates from the time of Louis XIV. It was last reorganized in 1882. It is intended to supply officers for the infantry, the cavalry, and the marine infantry.

The course of instruction lasts two years, and no scholar is allowed to remain more than three years at the school. The privilege of taking a third year to complete the course is only allowed where circumstances of exceptional gravity have compelled a student to suspend work at the school.

The school is subject to military discipline.

The cost of board (pension) is 1,000 francs and that of the outfit from 600 to 700 francs.

Bursarships or half bursarships may be granted to young men whose parents are unable to support them at the school. Outfits or partial outfits may also be allowed in such cases.

Admittance to the school is exclusively by competitive examination. The competition is divided into three parts:

(1) The papers ("compositions").

(2) The examination of the first degree (oral).

(3) The examination of the second degree (oral).

Competitors are limited to those who have obtained degrees as bachelier ès lettres, bachelier ès sciences, bachelier de l'enseignement spécial, or a certificate of qualification for the baccalaureate degree in secondary or classical modern schools.

Possession of one or more of these degrees or certificates gives a right to a number of points, varying from 40 to 15, according to the number and kinds of degrees possessed by the competitor. These count for admission only.

The programmes and dates of the entering examinations or competitions are published every year sufficiently long in advance to give candidates from the remotest parts of France plenty of time to compete. Candidates must be French born or naturalized, robust and well-formed, free from any ailment that would unfit them for the military service, and not less than 17 or more than 21 years of age on the 1st of January of the year of the competition. They must be registered as candidates before the night of the 15th of April, those not belonging to the army at the prefecture of the region where they are completing their studies, those already soldiers at the prefecture of the region where they are garrisoned. Scholars of the Prytanée Militaire need not register. The competitions for admission are held during the months of June and July at all the principal centers of each army corps region.

Accompanying his application to register, the candidate must furnish the proper birth certificates, a surgeon's certificate of vaccination, and a certificate from the local recruiting officer that he has military aptitude; also a statement of the place where he desires to be examined, and a statement from his parents or guardians that they are able to pay the expenses of board, etc., or if not so able, a request for a full or half bursarship.

COMPETITIONS.

Papers (*"compositions"*).—(*a*) A paper on the French language of the grade of the class of elementary mathematics; (*b*) an exercise in German, German script to be employed; also a translation from the German; both exercise and translation to be made without the help of a dictionary; (*c*) a mathematical paper; (*d*) a logarithmetic calculation, solution of a triangle; no tables allowed, except a five-place table of logarithms; (*e*) a simple problem in descriptive geometry, or in one-plane descriptive geometry; (*f*) a drawing in pencil, from a plaster cast; (*g*) a shaded copy of a landscape; (*h*) a topographical drawing, copy of a map on a scale of 1-20000.

A failure to turn in any one of these papers will exclude the candidate from the rest of the competition. However, an unfinished paper will not necessarily be a ground for exclusion.

In all the papers stress will be laid upon legible writing and correct spelling. Failure on these points will exclude a candidate from further competition.

The papers are judged by examiners and "correctors" appointed by the minister of war.

The marks given by the "correctors" range from 0 to 20.

The mark given to a paper is multiplied by the corresponding coefficient, and the result is the number of points gained by the candidate on such paper.

The mean of the marks on the pencil drawing and the landscape drawing gives the number of points allowed for drawing.

In any case where the sum of the products formed by multiplying the marks on the different papers by the corresponding coefficients is less than a certain limit the candidate is excluded.

This limit is fixed every year by the minister on the recommendation of the examining committee under the presidency of the director-general of infantry.

EXAMINATIONS OF THE FIRST DEGREE.

Taken in connection with the papers the examination of the first degree decides the question of "admissibility" in the case of any candidate. The subjects of this examination include all those mentioned in the programme, with the exception of the German language.

The board is composed of three examiners, one for the literary part and two for the scientific part.

The questions put to any candidate are drawn by lot from a number prepared by the examiners. Each examiner marks the candidate on the answers to the questions he has put to

him, on a scale ranging from 0 to 20; he multiplies this number by the corresponding coefficient and puts down the partial products on a sheet bearing the name of the candidate.

To obtain the total number of points to which a candidate is entitled on this oral examination, the examiners add together all these partial products.

To determine the total number of the points which will fix the position of the candidate in the order of merit, add together the total number of points obtained as just mentioned, the total number obtained on papers, those allowed for physical aptitude, and the credit or "majoration," if any, allowed for the literary diplomas or certificates.

Each examiner devotes, in general, twenty-five minutes to the examination of a candidate. All the answers of the candidate are considered in giving him his mark, which ranges between 0 and 20.

The examiners of the first degree put down, on a sheet bearing the name of the candidate, the three marks obtained, multiply each by the corresponding coefficient, and take the sum of the products. This result is added to the total number of points obtained on the papers.

In any case where the sum of all the points thus obtained is less than a certain limit the candidate is excluded from the examinations of the second degree.

The candidates who satisfy all the above conditions receive a certificate of "admissibility," on the presentation of which they are admitted to the examinations of the second degree.

EXAMINATIONS OF THE SECOND DEGREE.

For the examination of the second degree the board is composed of five examiners—three for the scientific part, one for history and geography, and one for German and English.

PHYSICAL APTITUDE.

Independently of the written or oral examinations, the candidates undergo another to determine their physical aptitude, their skill in riding, fencing, and gymnastics. The last three are obligatory.

A mark, ranging from 0 to 20, is given each candidate for each of the three separate examinations in riding, fencing, and gymnastics.

The effectives of the school are fixed every year by the minister of war, upon which depends the number of vacancies to be competed for. Heretofore the effectives were usually fixed at 900, which would give a yearly number of 450 admissions, or rather more. In 1894 the number of places to be competed for was 475, for which there were about 2,200 entries. For 1895 the number of admissions has been raised to 600, and the 150 additionals may be taken from those at the top of the list of successful candidates for entrance to the naval school.

Every candidate who receives an appointment, and who does not report to the commandant of the school within the time fixed by his letter of appointment, is considered as having resigned.

No one can be admitted to St. Cyr who is under the height of 1 meter 540 millimeters (about 61 inches), or who is laboring under any of the disabilities that would involve discharge from the army. Consequently, the appointees on their arrival at the school are subjected to a medical examination. If they pass this examination, they are required to sign an engagement to serve for three years.

Bursar cadets are required to serve for ten years, unless they make good the sums that have been advanced by the State for their board, etc.

PROGRAMME OF THE SUBJECTS OF EXAMINATION.

(1) History: The history of France and of Europe from the reign of Louis XIII to the present time. (Coincides as far as possible with the course of history taught at the "lycées," which correspond to our high schools.)

(2) Geography: (*a*) Europe: Physical geography; orography; hydrography; political geography; railways. (*b*) France: Physical geography; orography; hydrography; political geography; railways; internal navigation; colonies, particularly Algeria and Tunis. (*c*) Asia: Seas, coasts, islands, capes, etc.; orography; hydrography; foreign colonies; China and Japan. (*d*) Africa: Seas, coasts, islands, capes, etc.; rivers and lakes; European colonies; Egypt. (*e*) America: Seas, coasts, islands, capes, etc.; mountains and rivers; European colonies; United States; summary information on the other American States. (*f*) Oceanica: Archipelagoes and islands; European colonies.

(3) German language: A theme on the blackboard; reading German script; translating at sight; conversing in German.

(4) English language: Optional. Questions only.

(5) Algebra: Through the solution of equations of the first degree and equations of the second degree with one unknown quantity; also through arithmetical and geometrical progressions, including logarithms.

(6) Geometry: Through spherical geometry.

(7) Descriptive geometry and one-plane descriptive geometry: As far as the projection of the plane sections of spheres, cones, and cylinders of the second order.

(8) Plane trigonometry: Through the solution of triangles.

(9) Analytical geometry: Rectilinear coordinates only.

(10) Mechanics: Statics, cinematics, dynamics.

(11) Physics: Hydrostatics, heat, electricity, optics.

(12) Cosmography: Constellations and principal stars, celestial sphere, the earth, construction of maps.

(13) Topography: Planimetry, representation of the ground, accidents of ground, measure of distances on the ground, measure of angles, theory of the execution of a regular survey, estimation of the difference of level of two points.

Table of coefficients.

(1) Papers:		
French paper	14	
Mathematical paper	14	
Logarithmic calculation	2	
Problem in descriptive geometry	6	
Drawing from model	3	
Topographical drawing	2	
German theme	8	
German translation	4	
Total		53 53
(2) Examinations of the first degree:		
Physics, mechanics, cosmography, topography	10	
Algebra, geometry, descriptive geometry, trigonometry, analytical geometry	10	
History and geography	10	
Total		30 30
Sum of the coefficients for admissibility		83
(3) Examinations of the second degree:		
Literary subjects—		
French paper (supplementary coefficient)	2	
History	14	
Geography	14	
German	10	
English (optional)	2	

(3) Examinations of the second degree—Continued.		
Scientific subjects—		
Algebra and plane trigonometry	16	
Geometry	12	
Descriptive geometry	10	
Analytical geometry	10	
Cosmography and topography	6	
Physics and mechanics	18	
Total		114
(4) Physical aptitude:		
Riding	2	
Fencing	3	
Gymnastics	3	
Total		8
Sum of the coefficients for admission		205

SYSTEM OF INSTRUCTION, CURRICULUM, ETC.

The system of instruction followed is mainly that of lectures, there being several large rooms (amphitheaters) arranged for that purpose, which will seat from 150 to 200 students at a time, the benches being raised like the seats in a theater, so that every cadet may have a good view of the instructor, the blackboards, or the illustrations which the instructor may have to point out. A company of cadets is usually marched into the lecture room by its own company officers, and they carry with them their arms. After the lecture the companies are marched to one of the several large study rooms, where each cadet has his special desk, and works out the result of the lecture he has just heard. In addition to these lecture and study rooms, there are small examination rooms where the cadets are questioned on the work that they have completed in the study rooms as a result of the lecture previously had.

Course of instruction.—The course of instruction includes the following branches: Artillery, topography, military art and history, military legislation and administration, fortification, musketry, geography and statistics, military literature, German, and drawing.[1]

The cadets also receive instruction, practical and theoretical, in infantry and cavalry, and in gymnastics and fencing.

The purpose of the instruction given to the cadets is purely military.

During their stay at the school all the cadets also receive instruction in riding.

The cadets are divided into two divisions or classes corresponding to their respective years of instruction at the school. They are promoted from the second to the first division after passing the prescribed examination.

The cadets of the first division undergo a final or graduating examination.

A cadet who is dismissed for misconduct is sent to do duty in some regiment as a noncommissioned officer or private, according to the circumstances.

Those who fail at the final examinations, and who are not turned back at the school, are sent to regiments as noncommissioned officers to complete their three years' service. The successful graduates go to the infantry or cavalry or the marine infantry as second lieutenants. They rank in the army according to their graduating standing.

The school is organized on a military basis. The scholars live in the barracks and are formed into a battalion of eight companies, constituting one infantry battalion. This battalion ranks as

[1] See Table A, annexed, for the programme of instruction for a week in December, 1895.

the first of the army of France. The officers of the battalion are detailed from the army.[1] The sergeant-major, quartermaster-sergeant, sergeants, and corporals are detailed from the scholars of the senior class or division.

Those scholars who at the Easter examination of their first year have, at their own request, and after an examination by a board of cavalry officers, been designated for the cavalry, form a special section for cavalry instruction, inspections, and discipline. Once classed in the cavalry section, a cadet can not be taken out of it, except for some infirmity which would unfit him for mounted service.

The cavalry section has an organization corresponding very nearly to that of a squadron.[2] Its officers and acting noncommissioned officers are appointed in a manner similar to that prescribed for the school infantry battalion.

Cadets receive pay at the rate of 28 centimes (5½ cents) per day.

The number of graduates from St. Cyr in 1894 was 417, of whom 75 went into the cavalry and the remainder to the infantry.

Text-books.—The text-books used at the school are, as a general rule, compiled or written by the professors or instructors on duty at the school, and are peculiar to the institution. They are rewritten from year to year, or as often as is necessary to keep pace with military progress, and are mostly lithographed from manuscript, only a limited edition being published. For this reason they are seldom seen outside of the school.

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[1] Each of the companies of the infantry battalion is commanded by a captain-instructor, detailed from the army. The present regulations of the school (20th September, 1895) provide that each captain-instructor shall have under his orders four lieutenant-instructors, also detailed from the army. As a rule, the two senior lieutenants are in charge of the miiitary instruction of the scholars of the second year or senior class; the other two should then be employed in the instruction of the scholars of the first year. As the lieutenant-instructors are supposed to remain on duty at the school for two years, the cadets will remain under the same military instructors during the whole of the course.

As a matter of fact the number of lieutenants detailed at the school does not allow the assignment of four to each company. The number of lieutenants actually so detailed for each company appears to be only two.

[2] At present the cavalry section of the school is under the command of a chef d'escadrons (major). The cavalry scholars form two squadrons of cavalry, each consisting of four platoons. The 1st squadron is made up of the scholars of the second year or senior class; the 2d squadron includes only scholars of the first year. The 2d squadron is not formed until the 1st of January following the entrance of the class. Each squadron is commanded by a captain, who remains the instructor of his own particular squadron during the whole course of study.

The captain-instructors of cavalry are assisted by lieutenant-instructors, four of whom are attached to each squadron. These lieutenants act as platoon commanders, and have the same general duties as are prescribed for the lieutenant-instructors of the infantry companies.

The captain commanding the 2d squadron has charge of the special equestrian instruction of the infantry scholars of the second and first years. He is assisted in this duty by two lieutenants, one commanding the cavalry noncommissioned staff at the school, and the other commanding the remount detachment.

TABLE A.—*Distribution of time for the week ending Saturday, the 14th of December, 1895.*

Week.	Date.	Year.	Half battalions and squadrons.	8 a. m. 30	9 35 45	10 45	11	12 m. 15	1 p. m. 20 30	2	3 30	4	5	6	7	8 10	9 10
Second ..	Monday.	2d	Right half.							Etude libre.		German.					
			Left half.	Etude libre.		Drawing.								German.			
		1st	Right half.							Etude libre.		Drawing.		German.			
			Left half.	Etude libre.		German.											
	Tuesday.	2d	Right half.							Topography.	1	Questions.		Questions.			
			Left half.	Topography.	1	Inking in. (1)											
		1st	Right half.							Lecture on one-plane descrip tive geometry.		Questions.		Questions.			
			Left half.	Lecture on one-plane descrip-tive geometry.		Fortification sketch.											
	Wednesday.	2d	Right half.							Fortification.	4	Inking in.	(1)				
			Left half.	Fortification.	4	Questions.								Questions.			
		1st	Right half.							Modern history.	1	Fortification sketch.					
			Left half.	Modern history.	1	Questions.								Questions.			
	Thursday.	2d	Right half.							Etude libre.		Drawing.		German.			
			Left half.	Etude libre.		German.											
		1st	Right half.							Etude libre.		German.					
			Left half.	Etude libre		Drawing.								German.			
	Friday.	2d	Right half.							Legislation.	1	Questions.		Questions.			
			Left half.	Legislation.	1	Inking in. (2)											
		1st	Right half.							Geography.	1	Questions.		Questions.			
			Left half.	Geography.	1	Copy of map in pencil.											
	Saturday.	2d	Right half.							Topography.	2	Inking in.	(2)				
			Left half.	Topography.	2	Questions.								Questions.			
		1st	Right half.							Artillery.	1	Copy of map in pencil.	(1)				
			Left half.	Artillery.	1	Questions.								Questions.			

NOTE.—The hours of the day are indicated under the top border of the table; the minutes are written above the horizontal line next below. Hours for some of the other duties at this time of year are as follows: Reveille, 5.30 a. m. (5 a. m. in summer); coffee, 7.15 a. m.; dinner, 11.45 a. m.; lunch, 4.30 p. m.; supper, 8.10 p. m.; recreation, short period after each meal; taps, 9 p. m. "Etude libre" is sometimes translated "general study." During this time the cadets are at liberty to study what they please. Inspection of arms during this week was prescribed for Mondays, Wednesdays, and Fridays, from 12.15 to 1.15 p. m. At other times of the year the hours left unemployed in this table are generally taken up with drills or other exercises.

GERMANY (PRUSSIA).

The school which corresponds most nearly to the United States Military Academy is the "Haupt-Kadetten-Anstalt," or Upper Cadet School, at Gross-Lichterfelde.

This school is fed or supplied by the "Kadettenhausen," or preparatory cadet schools, of which there are now seven, viz, Goslin (formerly at Culmer), Potsdam, Wahlstadt, Bensberg, Plon, Cranienstein, and Karlsruhe. An eighth school is now building at Naumburg.

Beginning with the lowest class of the preparatory schools, the classes are designated as Sexta, or VI; Quinta, or V; Quarta, or IV; Unter-tertia, or U. III; Ober-tertia, or O. III; Unter-secunda, or U. II; Ober-secunda, or O. II; Unter-prima, or U. I; Ober-prima, or O. I. In addition there is an extra class called "selecta."

There are thus nine classes, counting from VI up to and including upper prima. The course of each of these classes lasts one year. The lower or preparatory schools contain the classes from VI up to and including upper tertia; the other classes belong to the upper cadet school. Occasionally, also, depending on the space available and the necessities of the case, some of the upper-tertia class are admitted to the upper cadet school. In the upper cadet school begins the immediate preparation for service. The classes from sexta up to and including upper prima are assimilated in the matter of instruction to the corresponding classes of the "Realschulen" of the first degree.

CONDITIONS OF ADMISSION.

The places at the cadet schools are divided into several different categories.

1. Royal or "budgetary" places, to which pupils are admitted either gratuitously or on payment of a yearly contribution of 90, 180, 300, or 450 marks.

2. "Pensionäre," those who pay for their "pension," or board, whose yearly contribution is fixed at 800 marks.

3. "Hospitanten," or externals, who pay a contribution of 60 marks.

4. Foreigners. Such foreigners as may be admitted form a special class of "pensionäre." Their yearly contribution is fixed at 1,500 marks.

1. *Royal cadets.*—These places are granted: (*a*) To the sons of officers, preference being given to the sons of officers who have been killed in battle or who have died in consequence of wounds or disease contracted in the field; (*b*) to the sons of noncommissioned officers; (*c*) to the sons of persons in the civil service who have greatly distinguished themselves.

Applications for these places are made when the boys are 8 or 9 years old, and are addressed to the officer who is at the head of the staff (command) of the "kadettenkorps." The staff is stationed in Berlin. A committee is appointed to decide on these applications. It consists of: (*a*) The inspector-general of the military educational establishments, chairman; (*b*) a delegate appointed by the war minister; (*c*) a delegate appointed by the minister of public worship; (*d*) the officer commanding the several corps of cadets; (*e*) the officer commanding the upper cadet school at Lichterfelde.

The committee throws out the applications which show no ground for admission, classes the candidates according to the sums which they will have to pay, taking into account the financial position of the parents and of the boys themselves. The Emperor makes the final decisions after the recommendations of the committee have been submitted to him.

2. *Pensionäre.*—Applications for pay places may be made in behalf of the sons of natives of any of the German States. Foreigners may also apply for these places, but they are only admitted when the rights of natives are not prejudiced thereby.

The number of pay places each year is dependent upon the number of royal cadets admitted.

Applications for pay places are addressed to the officer commanding the several corps of cadets, at his headquarters in Berlin. This officer decides upon these applications.

The youths who are successful in obtaining these "pensionäre" appointments are distributed to the different establishments, regard being paid to the residence of the parents and to the vacancies existing in the various schools.

For admission to any class, either as a royal cadet or as a pensioner, a boy must be between the ages of 10 and 15 years.

3. *"Hospitanten," or externals.*—These may be admitted to the preparatory cadet schools on the authority of the officer commanding the several corps of cadets, and in such numbers as the accommodations of the different schools will admit. They must be between the ages of 10 and 14 years, and must pay an annual contribution of 60 marks.

Sons of officers, instructors, professors, and officials of the cadet schools, when admitted as "hospitanten," are exempt from the payment of this contribution.

Sons of officers, instructors, etc., of the upper cadet school may also be admitted to this establishment as "hospitanten," provided they have not passed the age of 16 years.

EXAMINATIONS.

Boys who receive provisional appointments to any of the cadet schools must report for physical and mental examination at the institution to which they are appointed, as a rule at the beginning of April. If the surgical examinations show deficient physical development, or any defects that would exclude a person from entering the army, the boys are sent back to their parents and not allowed to take the mental examination.

The mental examinations are both oral and written. In the mental examination less stress is laid upon the scope of the candidate's information than upon its thoroughness. To enter the lowest class of a preparatory cadet school the candidate is examined in arithmetic and the German language only. More details of this examination will be given later. To enter a higher class than the sexta the candidate must pass an examination upon the course of the year preceding the class which they wish to enter.

In case a boy passes successfully both physical and mental examinations, he is admitted to the institution and uniformed.

ENTRANCE EXAMINATION FOR THE SEXTA.

German language.—Readiness in reading and writing, using both German and Latin characters. Ability to take down from dictation, without grave faults, an easy German theme.

Arithmetic.—Operations under the four fundamental rules of arithmetic. Writing and reading figures up to the number of seven places. Knowledge of the principal coins, measures, and weights.

No preparation in Latin or French is required.

The following table shows the subjects of instruction at the different cadet schools and the number of hours of instruction per week in each class and subject:

Subject.	Classes.								
	VI.	V.	IV.	U. III.	O. III.	U. II.	O. II.	U. I.	O. I.
Religion	2	2	2	2	2	2	1	2	2
German	4	3	3	3	3	3	3	3	3
Latin	7	7	6	4	4	3	3	3	3
French	.....	.....	6	8	4	4	3	5	4
English	.....	.....	.....	.....	4	4	4	4	4
Arithmetic and mathematics	4	5	4	5	5	5	5	4	5
History	1	1	2	2	2	2	4	3	3
Geography	2	2	2	2	2	2	3		
Natural history	2	2	2	2	.....	.....	.....	.....	.....
Physics	.....	.....	.....	.....	2	3	2	3	3
Chemistry	.....	.....	.....	.....	.....	.....	.....	3	3
Topographical drawing	.....	.....	.....	2	2	2	2	.....	.....
Free-hand drawing	2	2	1		(1)	(1)	(1)	(1)	(1)
Writing	2	2	.....	.....	.....	.....	.....	.....	.....
Total	26	26	28	30	30	30	30	30	30

[1] Optional.

The higher mathematical course embraces algebra, geometry, trigonometry, the elements of descriptive geometry, and analytical geometry (conic sections).

The course of the upper tertia class, in which an examination must be passed to enter the upper cadet school, comprises religion; German—prose and poetry, versification, arrangement of sentences; Latin—through Books I and V of De Bello Gallico; French—grammar, reading, and conversation; English—grammar, reading, and conversation; mathematics—geometry, higher arithmetic, and algebra through solution of equations of the first degree; history—history of Middle Ages up to 1648; geography—geography of Europe, especially of central Europe, the atmosphere, land, seas, inland waters; physics—general properties of bodies, solid, liquid, and gaseous, elements of heat and chemistry, chemical union and combustion; topographical and mathematical drawing—elements of projections and perspective, scales and conventional signs, etc., with an optional course in free-hand drawing and writing.

In all the schools the instruction begins on the 1st of April, at which dates cadets who have successfully passed the examinations of their respective classes are promoted a class. For the last five years the number of promotions in each class has averaged 90 per cent of the number examined. As shown by the preceding table, the number of hours spent in the class room each week is about 30. The morning hours, from 7 to 12, or in the winter from 8 to 1, are employed in this manner, though the time-table is not exactly the same in all the schools. After the morning school hours there is a roll call, at which the orders for the day are read, letters distributed, punishments announced, etc. A drill of half an hour comes next.

Then after dinner comes an hour's recreation, which should be taken, as far as possible, in the open air. Then two hours are devoted to police duty and work around the quarters under the supervision of the instructors. The two hours following are devoted to gymnastics and singing, bathing and swimming, fencing and target practice.

Sundays and holidays the cadets receive a greater amount of liberty than on ordinary days. There are vacations of fourteen days at Eastertide and Christmastide, and of five days at Whitsuntide. In summer there is a vacation of five weeks. About the 1st of October instruction is suspended for a few days, during which time cadets take part in military excursions, which in the upper cadet school have the character of field-service exercises.

Cadets are divided according to their conduct into what are called "Censur-Klassen," or conduct classes. All cadets who have just entered are assigned to the third of these classes. They are promoted to the second class for good conduct, and to the first class for exceptionally good conduct. The higher conduct classes enjoy special privileges and favors, in the matter of liberty especially. The fourth or lowest conduct class is a disciplinary section. Cadets who pass into this section are under close supervision and enjoy no privileges or liberty.

MILITARY ORGANIZATION.

The preparatory cadet schools, with one exception, are intended to accommodate 220 cadets each. The school of Plon has only room for 150. In each of these schools the boys are organized into two companies, the officers of which are detailed from the army. Corporals and sergeants are detailed from the cadets.

The theoretical course in the lower cadet schools is, as has been noticed before, the same or nearly the same as that of the Realschulen of the first degree, and military subjects are not embraced in the curriculum at all. The cadets, of course, are under military discipline, and the amount of drill and other exercises in which they have to take part has already been indicated. A constant effort is made by the military instructors to train the characters as well as the minds of the boys, and to cultivate correct deportment and manners and a high sense of honor.

THE UPPER CADET SCHOOL.

The entrance examination for this school and the studies pursued have already been outlined. Besides the branches already mentioned, the cadets receive instruction in the regulations of the service, so that they may be well grounded in these matters on entering the army. The upper-class cadets also receive instruction in riding. Guard mounting and guard duty are practiced twice a week.

The complement of the school is 1,000 cadets, organized into two battalions of five companies each. The officers of the companies and battalions are detailed from the army; the noncommissioned officers and even sword-knot ensigns are appointed from the cadets.

After passing successfully through two years of the course (the classes of the lower and upper secunda) a cadet is admitted to the Port-épée-Fähnrich's examination (sword-knot ensign's examination). This is held every year, in the spring, before the superior military examination committee of Berlin.

1. Those cadets who will attain their seventeenth year on the 1st of April, and who have the requisite physical development, are, if they pass this examination successfully, (*a*) either recommended for appointment in the army as brevet sword-knot ensigns (charakterisirte Port-épée-Fähnriche), or (*b*) are transferred to the selecta class in order to prepare directly for the officers' examination, or (*c*) transferred to the under prima.

Those cadets who, having passed through the upper secunda, fail at the ensign examination, or who, on account of unsatisfactory standing, are not admitted to it, are, as a rule, either returned to their parents or else entered in the army as privates, exceptionally as noncommissioned officers, for the discharge of their liability to military service.

(*b*) *Selecta.*—The course of the selecta class corresponds closely to that taken in the so-called "war schools," and consists entirely of military studies and the French and Russian languages. Selecta cadets are the only persons who receive directly officers' commissions. All other aspirants for commissions, whether cadets or "avantageurs," must first pass through the grade of sword-knot ensign.

The members of the selecta are at the close of their course, if deemed proficient, admitted to the officers' examination. Those who pass, and who seem qualified by reason of their conduct and bearing on and off duty, receive their appointments as second lieutenants at once. Such cadets as pass, but are not perfectly satisfactory, enter the army as ensigns, and may gain their commissions in from two to six months. Those who fail are also appointed ensigns and sent to regiments, to be reexamined at the end of three months.

Those cadets of the upper secunda who are admitted to the selecta and gain high rank in this class have a considerable advantage over those of the same class who enter the army as brevet sword-knot ensigns. The first-named get their second lieutenancies about one year after the expiration of the upper-secunda course, while the greater number who are transferred to the army as brevet sword-knot ensigns only gain their commissions in about one year and seven months.

This time is made up about as follows:

First, the cadets appointed sword-knot ensigns are sent to regiments to serve for five months from about the 1st of May, and at the end of that time they ought to have won the "dienstzeugniss," or military-qualification certificate, from their respective squadron, battery, or company commanders. This entitles them to the grade of actual or effective sword-knot ensign and to admission to the October course of a war school. If the conduct and application to duty of a brevet sword-knot ensign are satisfactory, he is ordered to attend a war school, even if he has not on the 1st of October quite completed full five months' service with troops. The war-school course lasts nine or ten months, at the end of which time, if the pupil's marks are satisfactory, he is

admitted to the officers' examination, after passing which the aspirant is nominated to the Emperor for a commission as a second lieutenant, provided he is acceptable to the majority of the officers of the regiment to which he has been assigned.

(*c*) *The under prima.*—To this class of the upper-cadet school are transferred those cadets who pass the Port-épée-Fähnrich's examination, but who have not yet attained to the prescribed age or the requisite physical development.

To the under-prima class are also transferred those upper-secunda cadets who pass the examination with credit, and who have attained the prescribed age and the requisite development, provided the parents of the cadets request this transfer.

Those cadets who pass through the under prima successfully, and who have attained the prescribed age and physical development, are disposed of as follows, according to the desire of their parents:

They are recommended for appointment in the army, according to their standing, as actual or brevet sword-knot ensigns; or they may be transferred to the upper prima in order to prepare for the Abiturienten or Maturitäts examination (the diploma granted to a person who has passed this examination is a qualification for admission to a university course); or they may be, in special exceptional cases, transferred to the selecta.

2. *The upper prima.*—Cadets who have gone through the upper-prima course come up for their Abiturienten examination before the examining committee of the cadet corps, and those who pass this examination are appointed actual sword-knot ensigns, and at the same time are sent to take the course at a war school. At the completion of the war-school course, those who have passed with the rating of at least "good" receive with their promotion to the grade of second lieutenant a commission bearing the date of their entrance into the army.

Upper-prima cadets are also appointed to be sword-knot noncommissioned officers if warranted by their general standing and conduct. Upper-prima cadets are to receive, also, as far as possible, instruction in military branches along with their regular theoretical instruction.

The final examination for the upper-prima cadets, or the Abiturienten examination, is to be so arranged that it will be over by the 1st of February.

The war-school course for the successful upper-prima cadets begins on the 1st of March, but before joining the war school they are to report to the respective squadrons, batteries, or companies to which they are assigned, not later than the 25th of February, for the purpose of taking the oath and receiving their uniforms.

As has been shown, the higher selecta cadets have the advantage in the race for the officers' commission, since it takes them only about three years from the date of entering the upper-cadet school to attain this grade (two years in the under and upper secunda and one year in the selecta). Those who go through both under and upper prima are the last to get commissions, since in the most favorable cases they get rank as second lieutenants only from the date of their entrance into the army, or over four years from the time of their entrance into the upper-cadet school. On the other hand, if a youth is forced to give up the military career for any cause, the one who has passed his Abiturienten examination has the best chance in civil life, since the same careers are open to him that are open to the "Abiturienten" of the "Realgymnasia."

The following table shows for three years the number of cadets graduating into the army from the cadet corps, and the different classes into which they were divided:

	Second lieutenants.	Actual sword knot ensigns.	Brevet ensigns.
1891–92	90	36	153
1892–93	90	21	162
1893–94	87	27	199

War schools.—The programme of these schools, which is essentially the same as that of the selecta class at the upper-cadet school, and upon which the officers' examination is based, comprises the following subjects:

1. *Tactics.*—Theoretical instruction, and also practical exercises, as follows: (*a*) Formal tactics, taught by drills of the pupils in the company, battalion (skeleton), squadron (with horses), and the battery (harnessed), attendance at the exercises of troops on the drill ground; (*b*) applied tactics, taught by solution of problems on the map, solution of problems on the terrain, to which about two weeks of the practical course are devoted; attendance at suitable maneuvers of troops on the terrain, exercises in kriegsspiel.

2. *Science of arms.*—This is to teach the construction of the guns and arms used in the German army, practical ballistics, and the effect of the projectiles of both artillery and infantry; and also with regard to the effect of projectiles, the employment in action of the two arms just mentioned. This instruction is furthered in various ways: (*a*) By the dilligent use of the various aids provided for object instruction. (*b*) By visits of inspection to various technical establishments and depots. (*c*) By drills at the guns. (*d*) By the execution of the minor firing exercises for instruction, according to the infantry firing regulations, by the best shots among the pupils. (*e*) By attendance at the target ranges of infantry and artillery.

3. *Science of fortification.*—The course comprises field fortification, permanent fortification, and the attack and defense of fortifications. The instruction in this course is furthered by the following exercises: (*a*) By visits of inspection to various permanent works. (*b*) By attendance at the various pioneer exercises. (*c*) By the execution by the pupils themselves of shelter trenches of various profiles. (*d*) Examples on the map, relating to the fortification of a position of small extent on the basis of a certain tactical disposition. (*e*) The same kind of exercises on the terrain. The lines of projected works are simply to be outlined with flags or stakes.

In these last exercises several days of the practical course are to be employed.

4. *Study of ground.*—The study of this branch deals with the knowledge and description of the surface of the earth, with reference only to the military significance of the terrain and its influence upon the employment of troops; all deviations into the province of geodesy or of military and physical geography are to be avoided. The study of ground forms not only the basis for topographical drawing and surveying, but also the basis for applied tactics.

5. *Topographical drawing.*—The instruction in this branch comprises a primary triangulation of a tract, topographical land surveying, and hasty surveying for special purposes. Use of surveying instruments is also taught.

6. *Army organization.*—This instruction comprises a detailed study of the peace organization of the German army and its historical development, and also of its recruitment, mobilization for war, and the different war formations. It includes also a course in military justice, etc. A short course is also given on the organization of the German navy.

7. *Instruction in foreign languages.*—(*a*) French: This is intended to perfect the pupil in the language of conversation, both oral and written. (*b*) Russian: The instruction in this language is only elementary, the idea being to lay the foundation, which the pupil can improve upon later; it will therefore be limited to reading, writing, as well as translating simple sentences.

8. *Military correspondence, etc.*—This includes practice in the making out of such dispatches, letters, reports, records, rolls, and accounts as are used in the interior service of a company, squadron, etc., and such as are required from an officer exercising an independent command.

9. *Regulations and duties, etc.*—The instruction in this branch embraces the service of subaltern officers, including the instruction to be imparted by them to the men. For mounted officers this includes the contents of the riding instruction and stable service; also a short course in veterinary surgery and farriery. Pupils who belong to the dismounted arms receive instruction in saddling, bridling, care of horses, and the diseases of horses; also in shoeing, as far as such information is

necessary for mounted officers of infantry. The subjects mentioned under this head (9) form no part of the officer's examination, however.

10. *Special instruction.*—Special instruction, aside from that mentioned under the head of (9), is given only to: (*a*) Pupils who are aspirants for commissions in the field or foot artillery, who, separate from each other, are trained in the first term or quarter of the course in the duties of gunners in their respective arms, so that they may be employed in this capacity in the gun drills of the other pupils; (*b*) pupils who are aspirants for commissions in the pioneers, who are exercised in simple branches of field pioneer work.

11. *Drills and exercises.*—The purpose of the practical exercises is as follows: (*a*) The improvement of the bearing and discipline, completion and strengthening of the instruction begun for this purpose in the companies, etc. (*b*) Exercises in commanding, instructing, and correcting. (*c*) Completion of the instruction in elementary tactics, in which the pupils must be trained for the duties of section or platoon commanders.

12. *Firing instruction.*—The preliminary exercises mentioned in the firing regulations, and also a careful instruction in the science of musketry, must precede actual target practice. The target practice includes: (*a*) Firing with target ammunition. (*b*) The school exercises of the second class, according to the firing regulations for infantry or cavalry, with either the rifle or carbine. (*c*) Exercises in revolver firing, according to the firing regulations for infantry or cavalry. (*d*) Instructional firing for ballistic purposes.

13. *Gymnastics, fencing, and swimming.*—Gymnastics: The instruction in gymnastics is for all pupils, but the training differs according to the arms in which they will serve. Fencing: For all pupils, to include fencing with the broadsword; for infantry, in addition, the bayonet exercise. Exercises in swimming are to be held whenever the opportunities occur and the means at hand will permit.

14. *Riding.*—The aim of the instruction in riding is to enable the pupils who belong to the dismounted arms to ride the average troop horse with a firm and easy seat, and over all sorts of ground.

The instruction of the pupils of the mounted arms corresponds to the requirements of the services to which they will be assigned.

15. *Visits of inspection outside of the garrison.*—Five or six days, depending on the location of the different war schools, are spent by the pupils in these visits. They are made to various fortifications, pioneer exercise grounds, polygons, etc. At the war school of Potsdam five days are allowed for this purpose, and are divided in the following manner: Two days in Spandau (fortress and military establishments); one day in Berlin (pioneer exercise ground); one day in Jüterbog (artillery polygon); one day in Spandau (firing school).

The whole period of instruction at the war schools is divided into four terms or quarters. Three of these terms are devoted to the theoretical course, while the fourth, which lasts about six weeks, is occupied by the practical course.

It is to be remarked that with few exceptions all the officers of the army pass through the war schools. The exceptions are: (*a*) Youths who have studied for one year at a university or certain high-class technical schools. "Avantageurs" of this class may at once be given the educational certificate required for a Port-épée-Fähnrich, and are eligible for the officers' examination without having six months' service. They must, however, be "chosen" before being appointed second lieutenants. (*b*) Cadets of the selecta class. As has been already explained, the selecta cadets are the only aspirants for commissions who are exempt from being "thrown out" by a vote of the corps of officers of the unit to which they are assigned. (*c*) Officers of the reserve who are transferred to the active army do not pass through the war schools.

Ensigns of foot artillery and engineers who have passed the officers' examination are first appointed supernumerary or extrabudgetary second lieutenants of their respective arms, and are

only appointed full, or "etatsmässige," second lieutenants after going successfully through the combined artillery and engineer school at Berlin, and passing the professional or "Berufs" examination before the "examining committee of the foot artillery and engineer and pionnier corps."

Before attending the courses of this school, all foot artillery and engineer officers are sent to their respective battalions or corps to serve about one year and nine months.

Formerly the officers of field artillery were on the same footing as the officers of the foot artillery in that they were commissioned at the start as supernumerary second lieutenants, and were obliged to pass through the combined artillery and engineer school before receiving their final commissions as officers. For the last three years, however, they have been on the same footing with regard to first appointments as officers of infantry and cavalry, and are exempt from attending the artillery and engineer school and from passing the "Berufs-Prüfung." For the purpose of receiving their final instruction, however, they have to attend a course of four months at the field-artillery firing school.

Saxony and Bavaria.—Saxony and Bavaria have their own cadet corps corresponding to the preparatory and upper cadet schools of Prussia, from which appointments are made to the Saxon, or Twelfth, army corps and to the corps of the Bavarian army. Saxony, however, has no artillery and engineer school, and officers of those arms have to pass through the Prussian school at Berlin. Bavaria has its own artillery and engineer school at Munich.

Reenlistments and Guaranties of Employment for Noncommissioned Officers and Ex-soldiers in European Armies.

AUSTRIA-HUNGARY.

Like all European powers which are maintaining a large standing army, Austria is compelled to offer considerable inducements to the noncommissioned officers to tempt them to reenlist in the service and thus keep the corps of noncommissioned officers up to the high standard required of it.

The inducements provided are: (1) Bounties; (2) special employment for noncommissioned officers; (3) permission to marry; (4) pensions and admittance to soldiers' homes; (5) employment in civil life.

1. The bounties given to noncommissioned officers are in the shape of additional pay while they are in service, and amount to 17 florins per month for first sergeants, 14 for sergeants, and 9.5 for corporals. The Austrian florin is 40.6 cents, United States money, and the real nature of the inducement will become apparent when it is stated that the ordinary monthly pay of the above-named noncommissioned officers amounts to 10.5, 6, and 4.50 florins, respectively; in other words, the pay of reenlisted noncommissioned officers is, in round figures, three times that of the ordinary noncommissioned officer.

2. Special employment consists in the assignment to particular commands or places, such as the Life Guard Infantry Company.

3. Permission to marry is of two kinds, one being simply permission without official recognition of the family; the other, which is given to about 10 per cent of the noncommissioned officers, recognizes the family by making provisions for same.

4. Pensions are granted according to injuries received.

5. But the most potent of all these inducements is the guaranty of civil employment after faithful service of twelve years in the army, when the last eight have been passed in the grade of noncommissioned officer.

The places in the gift of the State for noncommissioned officers number in all 59,641, with a total pay of 27,824,566 florins, giving an average pay of 466.53 florins. The reserved places are divided into two classes, such as are exclusively reserved for the noncommissioned officers holding the certificate for civil employment and those in competing for which they are given preference. According to the report of Lieutenant-Colonel Dawson, Coldstream Guards, of January 30, 1893, about 530 posts are annually given to these noncommissioned officers, while the number of those qualifying each year for civil employment amounts to 650. In that year there were 2,400 noncommissioned officers serving in the army holding the certificate of employment and awaiting vacancies. The number of applicants is, therefore, considerably in excess of the vacancies.

The law providing for civil employment dates from April 19, 1872, and reads as follows:

LAW OF APRIL 19, 1872, RESPECTING THE GRANTING OF CIVIL EMPLOYMENT TO RETIRED NONCOMMISSIONED OFFICERS.

With the object of carrying out the intention of paragraph 38, Wehrgesetz of December 5, 1868, the following has been passed by both Houses of the Reichsrath and received the imperial confirmation:

1. Noncommissioned officers who have fulfilled twelve years' service, of which at least eight years was as noncommissioned officer, in the active army, navy, or cadres and detachments of the landwehr, and have conducted themselves well, acquire the claim to being employed under the Government; also in the railways, steamship companies, and other undertakings that are subventioned by the State (par. 38, Wehrgesetz). Service as acting noncommissioned officer will be allowed to count in the eight years' noncommissioned-officer service.

2. Those noncommissioned officers also acquire a claim without reckoning length of service who, before the enemy or while serving as police, gendarmerie, etc., through being damaged in any way, become unfit for military service, always supposing they are capable of being employed in some civilian capacity.

3. In fulfillment of these claims there will be, for the noncommissioned officers mentioned in paragraphs 1 and 2—

(1) Certain posts reserved exclusively for them.

(2) Other posts in the granting of which they will be given a preference over other competitors.

4. The posts reserved exclusively for noncommissioned officers are—

(*a*) All servants and lower grade of inspectorship in the k. k.[1] bureaus, courts of justice, offices, penal and other establishments which either wholly or partly are maintained by the State.

(*b*) Those posts mentioned in the category of office and chancery servants, classified as second-class superintendents and traffic employees in the railways, steamship companies, and other undertakings subventioned or guaranteed by the State which will either be shortly concessioned or are already concessioned and which by their statutes, conditions of concessions, or otherwise are bound to take into consideration the employment of retired noncommissioned officers. These reservations of posts are made irrespective of whether the situation so reserved is permanent or temporary.

5. In filling up the post of officials (Beamte) in bureaus of ordinary office clerks, in the courts of justice, offices, establishments, and other State undertakings which will only be granted either to officials who are not already in rececipt of a salary or who are at the moment unemployed, the preference will be given over all others to such fully qualified noncommissioned officers as have a claim thereto. These noncommissioned officers also enjoy a similar preference in the conferring of posts in the k. k. civil constabulary and in the customs.

6. The list of reserved posts and situations in the conferring of which noncommissioned officers enjoy a preference is to be officially tabulated, kept up to date, and promulgated from time to time.

7. A certificate, issued by the war ministry or ministry of defense, will be handed to the noncommissioned officers who, in accordance with the law, possess the claim either to a post reserved for them or a preference for competing for other posts.

If a noncommissioned officer is qualified for the post of official (Beamte) this fact must be stated in his certificate.

A list of certificates so granted has to be made, and reported up to date, by the war ministry of defense.

8. Noncommissioned officers possessing claims must apply for reserved situations, also for those posts in bureaus or in the constabulary where they have a preference, to the office or establishment competent to grant the same.

These applications can be made direct in the case of the applicant having left the army, or in the prescribed manner by those still serving.

9. A noncommissioned officer having a claim may apply—

(*a*) For a particular post already vacant.

(*b*) For a post about to become vacant.

In the latter case the fact of his having applied is to be duly noted.

10. When there occurs a vacancy, either in a reserved post or in one where a noncommissioned officer has a preference, the fact has to be published by the bureau or establishment which has the power of conferring the post, and the limit of time allowed for the competition is to be stated, due notice being given to the war ministry and ministry of defense.

No such publication need take place in the case of posts vacant in the bureau and establishments mentioned in paragraph 4 (*b*) when applicants who have a claim thereto have already been registered as such, or if the post is being conferred upon such applicant.

11. All authorities, offices, and institutions who have the right to confer reserved posts, or such situations of officials or police constables in the granting of which noncommissioned officers have a preference, are obliged to

[1] Austrian (kaiserlich-königlich).

register each application made to them for a post about to become vacant, and to hand to each applicant papers stating that they have so applied, and giving the number of applicants who have previously applied.

12. Each applicant must, in addition to setting forth his claim (par. 7), give the necessary details as to physique and a special qualification for the service he seeks. Applicants must in all cases prove that they are citizens of the kingdoms and crown lands represented in the Reichsrath..

13. Reserved posts (par. 4) can be held only by noncommissioned officers having a claim thereto (pars. 1 and 2), except in cases where no qualified applicant has applied for them. The authorities mentioned in paragraph 11 are free to choose among qualified applicants as they see fit.

14. Reserved posts, within the meaning of the above paragraph, means those to which the lowest amount of pay is attached.

15. Each applicant having a claim has the right to lodge a complaint in case any reserved post, or one where he has a preference, shall have been filled up in contravention of the enactment of this law.

16. In case reserved post be conferred on a person not possessing a claim thereto, except in the case stated in paragraph 13, or if posts such as are mentioned in paragraph 5, such as officials and police constables, are filled in contravention of the preference granted to certain noncommissioned officers, then the ministry under whose control the authority or establishment so having conferred the post is placed can declare such appointment invalid, and can direct the person so appointed to be dismissed. Such action can not be taken on the part of the ministry if a period of one year has elapsed between the time of filling the post and the ministry becoming cognizant thereof. If a post has been so filled in contravention of the provisos of this law by any of the establishments mentioned in paragraph 4, such action renders such establishment liable to a fine of 100 to 500 florins, which sum is to be added to the charity fund of the district, and the plea that the filling of the post is lawful from the lapse of time shall not exempt from the fine.

17. The claim to a reserved post, or priority of claim in the case of officials or police constables' situations, is forfeited in the following cases:

(*a*) By being voluntarily resigned.

(*b*) If the candidate is convicted of such crime or misdemeanor as carries with it the loss of public and Government situations.

(*c*) Through candidates having passed the age of 45, and this only in the case of those situations the salaries of which are wholly or partly paid out of the State exchequer.

(*d*) Through candidates having passed the age of 37 in the case of those situations which are not paid for by the State.

Whenever a claim is forfeited this fact has to appear on the register (par. 7) on which vacancies are entered, the certificate granted being at the same time withdrawn from the holder thereof. In case of only part of the claim becoming void (par. 17 (*d*)), a remark to this effect has to be subjoined to the certificate and to the name of the candidate on the register.

18. All certificates granted to qualified persons, their applications in writing for reserved posts or for those where they have the preference, as well as all documents subjoined to applications for reserved situations, or to be placed on the candidates' register, enjoy immunity from stamp duties.

19. In granting concessions to railways and steamship companies destined to be worked in the interests of public traffic, care must be taken that the documents referring to the concession expressly represent the companies concerned as submitting to the enactments of this law.

20. The imperial decree of December 19, 1853, No. 266, becomes void, but the claims obtained under it remain in force, the persons enjoying them receiving the certificate as per paragraph 7.

21. The minister of national defense, in consultation with the other central departments concerned, is charged with executing this law.

Signed at Schönbrunn, April 19, 1872.

This law is supplemented by the following ministerial order:

ORDER OF THE MINISTRY OF DEFENSE, DATED JULY 12, 1872, IN CONSULTATION WITH THE OTHER CENTRAL AUTHORITIES CONCERNED, FOR CARRYING OUT THE LAW OF APRIL 19, 1872.

1. Certificates showing claims to posts are to be issued by the war office or ministry of defense according to the branch of the service to which the noncommissioned officer belongs.

2. Lists of posts to be referred to are to be found under Schedule A. (See Appendix I.)[1]

3. Men actually serving obtain their certificates through their regiments; others through the nearest "Ergänzungsbezirks Commando."

4. Commanders or other authorities must send in lists according to Form B (see Appendix II),[1] showing qualifications, physique, etc., of men qualified.

5. War office and defense ministry to keep lists of all men duly qualified for such posts, all claims thereto being previously adjudicated by a special commission.

[1] Omitted in translation.

Those whose names are entered on the register as qualified are to be provided with the certificates mentioned in paragraph 1, and which vary according to the grade of post applied for. These are given on Forms C, D, E, and F. (For descriptions see Appendix III.)[1]

6. Those in possession of certificates, if still serving, to send in their application for vacant posts, or for registration for posts as they become vacant, through their commanding officer.

Those who have left the army apply for these posts direct.

The certificates of the latter must be accompanied (*a*) by one from the head of their commune as to character; (*b*) by one from a doctor; (*c*) by one from an employer as to their special qualifications for the post applied for.

In the case of those actually serving, similar certificates to be sent in by their commanding officers. The latter are bound to answer any questions relative to candidates which may be addressed to them by the institutes in whose gift the posts are.

7. In case of any applicant asking for his name to be put on the register, or applying for any vacant appointment, his certificate and other documents must be returned to him after inspection.

8. Applicants granted posts receive the lowest rate of pay on entering, but those exceptionally qualified are at once advanced.

9. Institutions having vacancies in notifying to the war office, as laid down in paragraph 10 of the law, must give a list of applications (if any) that have already been made. The notification is to be made on Form G. (See Appendix IV.)[1]

Notices of vacancies occurring, with details thereof, are to be published in the regimental orders of the day.

The usual period before filling up a post is to be four weeks, but under exceptional circumstances fourteen days.

10. A noncommissioned officer who is granted a post receives an order to take it up, and a decree conferring the post, through the same channel by which he applied for it. Commanding officers are bound to allow a noncommissioned officer so posted to take his situation at once.

Men granted permanent posts who have fulfilled their term of service receive their discharge from the army; others, if temporarily posted, are sent on furlough until they receive a permanent post, or else fulfill their term of service.

In the case of a man still on the active establishment, or in receipt of invalid pay taking up a post, the question whether he is to be permanently or temporarily discharged from the army rests with the military authorities in conjunction with the intended employers.

11. For posts requiring a term of probationary service a noncommissioned officer on the active list is granted six months' leave, the ordinary army pay being given him if he receives no salary from his post during such probation. Only noncommissioned officers applying for posts requiring an examination can be granted leave to work during their twelve years' service.

12. Whenever a noncommissioned officer is granted a situation, the office employing him has to give notice of the same to the ministry of war or defense. Lists of posts so given are to be prepared by the war and defense ministries, and to be sent quarterly to all public offices concerned.

13. If any post is filled up in contravention of this law, an applicant thereby excluded can forward a complaint to the notice of the department empowered to deal with such cases, or to the war or defense ministries direct.

14. All changes of quarters or garrison, or in the condition of life, such as invaliding, discharge, etc., of claimants for posts at the time actively employed, to be notified to the ministry concerned, and the future addresses of the men to be subjoined. On such a claimant taking up his residence in a district, notice must be given by the military authorities under whose command he has been.

In the case of claimants no longer on the active list, a like notice has to be given with regard to the changes above mentioned, or in case of death by the "Ergänzungsbezirks" and Landwehr authorities to whose district the man belongs. It follows that the "Ergänzungsbezirks" and Landwehr authorities have a complete list of all retired noncommissioned officers residing in their district who have a claim for employment. Their register has to contain the name in full, rank, creed, branch of the service, and other details; also, the number of the certificate, and whence issued, of every claimant.

The age limits for posts under Government being 45, and for certain other posts 37 (in both cases the age for entering on the post is meant), the fact of a claimant attaining the limits must be notified.

If a certificate is withdrawn this fact must be notified.

15, 16, 17. Treat of the forfeiture of certificates through conviction in a criminal court, lapse of certificates through death or age, limit being passed, renewal in case of loss, etc.

In concluding his report Lieutenant-Colonel Dawson states:

* * * * * * * * *

The relations between the army and the civilian population are of a most cordial nature in a country where, as regards military service, all are equally bounden. Such a thing as looking down on the soldier does not exist here. Hotel and restaurant keepers, theater, and other places of amusement proprietors, even employers of labor, make

[1] Omitted in translation.

no distinction between the soldier and the civilian; indeed, the latter are known to prefer old soldiers. In short, the uniform is under all circumstances here a passport to respect, consideration, and welcome.

The habits of discipline learned during service, the healthy outdoor life and development of the manhood of the Empire by exercise and by regular food, are acknowledged as a boon by nearly the whole community.

In conclusion, I beg to remark that such a condition of affairs is only possible where throughout the whole system good character is an absolute necessity. A good character here is essential for prolongation of service, and prolongation of service is essential to insure provision for old age. Hence the tacit, and in many cases even contented, acceptance of universal conscription by the great mass of thinking people, who, though they deplore and groan under the expense entailed, have learned to look on it as a necessity which must be made the best of. In acknowledging the claims of the soldier who has served his country conscientiously the employer of labor is performing his part, while in taking care that none but well-behaved men shall remain in the service the military authority reciprocates.

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ENGLAND.

Since the system of short service has been in operation in England from 32,000 to 36,000 recruits are required each year to fill up the army, and on the other hand a correspondingly large number of men revert annually to the civil status.

The question of providing for these discharged men has been the subject of considerable study and practical effort in Great Britain for a number of years, as it bears directly on the number and character of new enlistments as well as on the state of society; unemployed ex-soldiers being as undesirable a class of men as any other unemployed. While in other countries civil employment is assured after a certain term of service to faithful noncommissioned officers in order to induce them to reenlist, it is in Great Britain, in the first place, a question of getting the men to enlist from whom noncommissioned officers may be made.

The first official inquiry into the subject of civil employment of ex-soldiers was made in 1876 by the select committee of the House of Commons, which recommended the appointment of discharged soldiers to certain positions in the civil service; but no organized effort was made to obtain places for meritorious ex-soldiers. In 1883 a committee was appointed by the treasury, which reported in favor of employing discharged soldiers and sailors in the lower branches of employment, and in 1884 the war office issued instructions for the establishment of registers in every regimental district for the purpose of enabling reserve men and discharged soldiers living within such district to obtain employment. The subject thus became a matter recognized by the Queen's regulations.

The most powerful impulse to the movement for providing employment for discharged soldiers was given by the establishment, in 1885, of the National Association for the Employment of the Reserve and Discharged Soldiers. The association was entirely a private undertaking, but was so far recognized by Parliament in the next year as to receive an annual grant of £250. The subsequent history of the movement may best be stated in the words of Gen. William Fielding in his testimony before the select committee of the House of Commons on July 17, 1894. He says among other things:

In 1887 the financial secretary, Mr. Broderick, inquired into the whole subject of the employment of ex-soldiers in Government appointments, and came to the conclusion that compulsion would have to be applied in some form to secure such a number of Government posts as would be of appreciable benefit. In February, 1888, his royal highness, the commander-in-chief, addressed a letter to the secretary of state for war, mentioning the efforts made by the National Association for the Employment of Reserve and Discharged Soldiers, and by the officers in charge of regimental district registers, and urging that the subject be brought to the notice of the Government with the view to preference being given to ex-soldiers when filling up vacancies in the civil departments of the State for which they are eligible, such as writers, messengers, porters, gate keepers, letter carriers, etc. The secretary of state circulated the letter to Government departments with a strong expression of his hope that his royal highness' request would be complied with. On the 1st of January, 1892, appointments as postmen, etc., which had been previously only open to reserve men in Leinster, Munster, or Connaught, were reserved for ex-soldiers throughout the United Kingdom, the only class having preference of ex-soldiers in filling those appointments being the telegraph messengers, who were already in the post-office employ.

In the summer of 1892 the managers of the principal railway companies were convoked at the war office by the then secretary of state, and about twenty of them were present. Through their mouthpiece, Sir Henry Oakley, they expressed their willingness to help the Government in this matter, but said that they could not possibly conceive that it was likely that more than 2,000 of these posts would be vacant in any one year. During that year, 1892, or early in that year, it having been found that the regimental registers had been productive of very good results, the officers in charge of these registries were urged to form regimental district associations for the purpose of employing reserve soldiers, these associations to be composed of the most influential people within their area, and to put themselves into personal communication with all the employers of labor whom they could meet. When these were once constituted it became necessary to consider how far it was wise that these associations should be considered official or voluntary. It was decided that they should be voluntary and that they should be recommended to become branches of the National Association, because it was thought, and rightly so, I think, that official associations of this sort would be more likely to do the work perfunctorily, and, perhaps, with a slackness, than if they were affiliated with such a body as the National Association, the committee of which is composed of officers of the highest rank, and employers of labor and other civilians who take a personal interest in the question. That committee would always be composed of the same stamp of people, having a personal interest in the soldier, whereas, if the control rested with the head of a Government department, that official might or might not take a personal interest in that particular work.

A pamphlet, entitled Guide to Obtaining Civil Employment, and issued by the publishing house of Gale & Polden, enumerates in addition to the National Association, several others, all private, and established for the purpose of providing employment for the reserve man or discharged soldier. These societies are, "The Army and Navy Pensioners' Employment Society," the "Corps of Commissionaires," "The Riflemen's Association, Winchester," and "The Loyal Association of Pensioners, Dublin." The operation of some of these societies is limited to special corps.

In his annual report for 1894 the inspector-general of recruiting states that the number on the official registers for employment in 1892, 1893, and 1894 was 5,642, 6,775, and 7,827, respectively, and that the total number of men for whom employment was found was for the same years 2,197, 2,914, and 1,448, respectively.

It is thus seen that so far any preference British ex-soldiers have received in appointments to Government places has been through the untiring and gratuitous efforts of their officers, and that the Government is apparently rather indifferent as to what becomes of men on reverting to civil life, after spending the best years of their lives in the public service at the risk of life and limb.

FRANCE.

The disinclination of noncommissioned officers to reenlist is making itself felt, and seriously disturbs the military authorities. No soldier may reenlist except he be a noncommissioned officer, a corporal, or a private recommended for corporal (gradé). The periods for reenlistment are for two, three, or five years, at the option of the soldier, these several periods of reenlistment carrying with them a graduated amount of bounty, according to the length of the reenlistment. Any noncommissioned officer may reenlist so that with his original service he may have a total of fifteen years of active service, but no longer. Their applications must be filed at least two months previous to the expiration of their original enlistment or subsequent reenlistments. The applicant must draw up his request in his own handwriting, and send it up through his company commander, who, after having indorsed thereon his remarks, forwards it, accompanied by a statement of the man's service, a brief of his punishments, and a certificate of aptitude formulated by the post surgeon. These papers all pass through the hands of the battalion commander, who indorses on them his remarks and sends them to the regimental commander.

The limit of reenlisted noncommissioned officers carrying bounty must not exceed two-thirds of the normal strength of the noncommissioned officers. The noncommissioned officers of the regimental staff are not limited in their reenlistments, as are the noncommissioned officers of the companies. A corps commander may authorize reenlistments of noncommissioned officers without bounty in excess of the two-thirds mentioned above.

The final authority for reenlistments emanates from the commander of the army corps, to which have come all the applications originating within the companies, supported by their auxiliary documents, to which, when they reach the corps commander and have been tabulated, has been added a statement from the treasurer or paymaster of the funds available for bounty. The table will also show the number of noncommissioned officers already reenlisted and serving within the corps.

Since 1889, when the number of reenlisted noncommissioned officers was limited to 27,593, and later circulars dated April 29, 1892, which brought the limit down to 22,566, at which number it now stands, the number of noncommissioned officers actually reenlisted has been steadily diminishing throughout the years 1893, 1894, and 1895, until on the 1st of November the total number of reenlisted was but 19,015, a difference of 3,551 below the number fixed by the ministry of war who might be reenlisted with bounty. In 1895 only 275 were reenlisted without bounty.

This falling off in reenlistments is attributed to several causes, one of which is the suppression of battalion sergeant-majors, which formerly afforded a promotion from the duty sergeants of companies, and was a certificate for the noncommissioned officer, on leaving the service, which was likely to promptly furnish him civil employment. Then, too, the bounties have been materially decreased; but what has caused the most dissatisfaction is the failure of the Government to provide adequate civil employment contemplated by law for discharged noncommissioned officers. Yet, annually, the civil employment furnished noncommissioned officers is very considerable, but the emolument attached to most of the places which they obtain in the various departments of the Government is so small that even that inducement fails. The strengths of the French and German armies differ but very little, but the showing of reenlistments among the noncommissioned officers in the two armies is significant. Whereas only 19,015 reenlisted noncommissioned officers existed in the French Army on the 1st of November, 1895, the number of noncommissioned officers reenlisted in the German Army was 78,000.

To remedy this growing defect, a new project of law concerning the reenlistment of noncommissioned officers and the best means of assuring civil-service employment to those noncommissioned officers when they leave the military service is about to be introduced into parliament, after having been carefully considered, not only by the minister of war, but by the entire cabinet of France.

There are said to be in France 763,000 civil officers of various kinds, and in consideration of that enormous number of places to be filled, as well as the encouragement which it is desired to offer capable soldiers to remain fifteen years in the service, as many as possible of these civil offices are to be reserved for reenlisted noncommissioned officers of the army who have completed their fifteen years of service with the colors.

The reenlisted noncommissioned officers who have completed fifteen years of service with the colors receive a pension. Those who are thus pensioned are for five years longer at the disposal of the minister of war for service in the territorial army or for drill masters in the preparatory military schools (for young soldiers or enfants de troupe).

Besides this pension, the reenlisted noncommissioned officers may be appointed to certain civil positions within the gift of the Government, as already mentioned, preference being given to those who have completed their fifteen years' service over those who have served more than ten years but not fifteen years. This latter class do not receive a pension, because of not having fulfilled fifteen years of service; yet they are eligible for appointment to certain civil positions. In either case it is necessary for the reenlisted noncommissioned officer to make application for civil employment in one of the departments, or services mentioned in a table annexed to the reenlistment law, the application to be filed during the last twelve months of his reenlisted service. This request, in writing, mentioning in the order of preference the civil employment he desires, is forwarded through the military channels to the heads of the departments in which those

civil employments exist. The candidates are then submitted to an examination, which will fix the professional aptitude of the candidate, and he is classified on a list of candidates according to the result of that examination. If the candidate leaves the service after having complied with the examinations for civil employment, and still not having received an appointment to that civil position, he may demand a certificate showing that he has completed the necessary time of service to entitle him to a civil employment. If, then, even after a lapse of time, he still desires one of these employments, he applies to the minister of war through the gendarmerie of the section in which he is domiciled. The right to go upon the classified lists is open to candidates up to the age of 40 years.

All the civil departments, within which exist the positions that may be filled by discharged soldiers, send every six months to the minister of war a list of the names of the military appointments that have been made, which list will also show how many vacancies there still exist, or will exist, within those different bureaus for the six months about to elapse.

These various lists are then sent by the minister of war to the President of the Republic, who institutes a commission to assign or allot the vacancies existing to the soldier candidates. This commission is composed of a counselor of state as president, two general officers of the army, an officer of high rank from the navy, a member of the intendance corps, a delegate each from the ministries of the interior, of finance, and of public works, an official from the bureau in which the employment to be given to the candidate exists, and two secretaries. It is the duty of this commission to draw up a list of the candidates capable of filling these reserved places as fast as they become available. The places are then given out in the order of merit of the candidates as classified by the commission and as fast as the vacancies are created. These lists are published in the official journal, and the minister of war notifies the noncommissioned-officer candidates within two months from the date that the notification comes from the commission. The minister of war also transmits to the chiefs of the ministries interested all the papers relating to each candidate who has been designated for a vacant employment. In case the commission so finds, the minister of war must be notified that no noncommissioned officers capable of filling the indicated vacancies have been found, and in such cases the minister of war also notifies the chiefs of the departments interested, who may then fill these appointments otherwise than by ex-soldiers, so that the public service may not suffer by the positions remaining unfilled.

That the intending candidates for civil employment may be kept informed of the vacancies existing, or about to exist, in the civil departments, the classified tables of these offices, already referred to, are periodically published throughout the army. This table not only gives the nature of each employment, but the salary or allowances attached to it. A peculiar feature of the law, which secures these civil employments to ex-soldiers, requires that no commercial or industrial enterprise may hereafter be chartered by the Government, or even by a municipality, except on the condition of reserving for ex-soldiers a certain number of positions.

The following is the list of civil employments that noncommissioned officers may secure:

MINISTRY OF FOREIGN AFFAIRS.

Forwarding clerks, watchmen, and messengers.

MINISTRY OF JUSTICE.

The same as above.

MINISTRY OF THE INTERIOR.

Same as the above, and in the prison department, as teachers, clerks, bookkeepers, warders, keepers, porters, etc. In all the other divisions of the department, as forwarding clerks, doorkeepers, etc. In the police department over one-half of all the places are reserved for ex-soldiers.

In Algiers all the places are reserved for ex-soldiers in some of the divisions; in others, from one-third to three-quarters.

MINISTRY OF FINANCES.

From one-third to three-quarters of the clerkships and watchmen.

MINISTRY OF WAR.

All the lower clerkships and watchmen, besides the porters at all the main buildings, and from one-half to three-quarters of the employees in the powder and saltpeter works.

MINISTRY OF MARINE.

The same as for the ministry of war, with the exception that preference therein is given to ex-sailors.

MINISTRY OF PUBLIC INSTRUCTION AND BEAUX ARTS.

From one-half to three-quarters of the clerkships, all of the watchmen and lower assistants, porters, etc., in all the buildings or museums and monuments.

MINISTRY OF AGRICULTURE.

All the lower clerkships and porters, and from one-half to three-quarters of the positions in charge of the horse-breeding establishments, the agricultural schools, and the forests.

MINISTRY OF COMMERCE AND INDUSTRY.

From three-quarters to all the lower positions, which includes the posts and telegraphs.

MINISTRY OF THE COLONIES.

From one-half to all the lower positions in all the offices located at Paris, as well as all those located in the French colonies all over the world.

Ministry of public works, which includes all the great works on bridges, mines, fish-culture establishments, the State railroad, the local custom-houses of Paris, the docks, sewers, water-works, markets, and theaters, from one-quarter to all the places. In the police department four-fifths of the appointments go to ex-soldiers.

The principal requirements are that the clerks shall have good handwriting and have a minor education. The porters, messengers, policemen, etc., must have robust health and be at least 1.64 meters in height. None of the examinations are particularly difficult.

Voluntary original enlistments, to a limited number, may be made in the French army in lieu of the service which would certainly be required under the general recruiting law of the country. The period of these enlistments is for three years, and must be taken during the month of March annually. A certain number per regiment only is allowed. For 1896 they are limited to five voluntary enlistments in each of the regiments of infantry, of zouaves, tirailleurs algériens, sapeurs-pompiers, artillery, and engineers, and to three for the battalions of chasseurs à pied and of garrison artillery. Voluntary enlistments may also be made in the remount service, but the number of the same must depend upon the needs of that service. No voluntary enlistments for three years can be made for the cavalry. Voluntary enlistments for the period of four or five years are still received for all the troops of cavalry, infantry, artillery, and engineers without limitation as to number.

These voluntary enlistments in the land forces are sometimes detached for service in the marine infantry or artillery, as sufficient volunteers for those services are not always obtainable.

This year (1896) 1,100 voluntary enlisted men for the army have been sent to the marine infantry and 300 to the marine artillery, and were distributed to the garrisons of Cherbourg, Brest, Lorient, Rochefort, and Toulon, from which points they will eventually be sent to the colonies for duty.

The benefit to the soldier of the voluntary enlistment is that he may be sent to his home, to await orders, at the expiration of one year.

GERMANY.

Recognizing the fact that a good corps of noncommissioned officers is the backbone of an army, and finding that the reenlistments were becoming fewer and fewer, an imperial decree was issued in 1885 making provision for enlisted men who become disabled in the service or serve a certain period. The increased facilities for gaining a good livelihood afforded by the great growth of industrial interests in Germany and the consequent falling off in reenlistments made it necessary to offer inducements for reenlistment at least equaling those held out by a civil career. These inducements are very substantial indeed. They consist in a bounty of 100 marks paid in cash on reenlistment to any reenlisting noncommissioned officer or private (to be made a noncommissioned officer as soon as a vacancy occurs), and a second bounty paid in cash on discharge as follows:

After a total service of—	Marks.
Five years	50
Six years	100
Seven years	200
Eight years	350
Nine years	550
Ten years	800
Eleven years	900
Twelve years	1,000

These amounts may not seem high to us, but they gain in size when considering that the bonus of 1,000 marks is equal to sixteen and two-thirds months' pay for a first sergeant, twenty-two and two-fifths months' pay for a vice first sergeant, twenty-eight months' pay for a sergeant, and forty months' pay for a corporal.

This cash bonus, however, does not represent the most substantial inducement held out as a reward for reenlistment. There is provided, besides, pension or admittance to an institution for invalids, the "Civil-versorgungs-schein," or certificate for civil employment.

In order to fit them for their position in the army as well as in the civil service afterwards, noncommissioned officers, after five or six years of service, are put through a course of instruction, among whose subjects are embraced German, history, arithmetic, mensuration, geography, map reading, and military correspondence. A certificate of proficiency is given to every noncommissioned officer who has successfully taken this course or has passed an examination in its various branches.

Noncommissioned officers desiring employment make application to the proper department through military channels. If otherwise acceptable, they must be able to show their qualification for the place, if necessary, by an examination. All appointments are probationary at first. If a noncommissioned officer be undergoing this probationary period previous to the expiration of twelve full years of service, an advance may be made to him of part of the bonus of 1,000 marks. If the noncommissioned officer fails to be accepted at the end of the probationary term and has to return to the colors, only such balance of the bonus as remains unpaid is handed over to him on subsequently obtaining civil employment.

Having once obtained employment in a department, promotion therein is regulated by separate regulations, in which the employment certificate plays no part.

If the possessor of an employment certificate is retired on a pension, the certificate becomes inoperative and must be turned in.

There are some 491 categories of employment obtainable by noncommissioned officers after twelve years of faithful service, of which 358 are exclusively reserved for the army and navy, with a total of 92,345 places, distributed over the postal and telegraph service, the admiralty, war ministry, railways, police and gendarmerie, collection of taxes and customs. In the greater part

of the remaining 133 categories from one-third to one-half of the places are reserved for army and navy.

"There is one hard and fast rule in connection with the places that are reserved, as detailed above, and that rule is that none of the posts set aside for candidates provided with an employment certificate may be given to others as long as the qualification of such candidate suffices. Places which are only partly given to the service are filled in fair rotation of turn between the military and civilian candidates, irrespective of the numbers of each already holding such places; that is to say, if a vacancy occurs by a civilian being removed, he may be replaced by a military candidate if it is the turn for such a one to be admitted.

"The system of giving civil employment to well-deserving old soldiers was started by the first King of Prussia in the early part of the eighteenth century. It was much encouraged by Frederick the Great and his two immediate successors, owing to the number of foreigners who in those years were accepted into the Prussian army, and to whom promises had to be made to induce them to serve. When, after the terrible defeat of Jena, Napoleon ordered Prussia to confine her standing army to 40,000 men, which led to the wise measure of conscription, and enabled this country rapidly to form a serviceable reserve, it was forced to select for its annual contingent the best and strongest of its youths for service with the colors; and in order to make this palatable, and to recruit its army out of the best of its human material, it was necessary to offer such inducements to good behavior as the State could grant.

"It must not, however, be accepted that this proved successful at once. Many were the subsequent laws which dealt with this question until the final one in 1885 welded the system into its present form; and thus it is seen that Prussia's King never ceased to consider and improve the lot and the future of the soldier who had served his country well and conducted himself like an honorable citizen.

"It is the army and navy that give the German his certificate of character. A well-conducted soldier or sailor who passes into the reserve after his three years' service is always sure to obtain employment. I have often seen advertisements for men in which the first essential has been 'that he must have been a soldier.' The great employers of labor infinitely prefer a man who has been schooled to discipline, regularity, cleanliness, and orderly conduct to youths who, for one reason or another, have become exempt from shouldering the musket."[1]

ITALY.

The provisions made by Italy for noncommissioned officers of long service are very similar to those of the other great military powers of Europe. They consist chiefly in extra pay paid to noncommissioned officers and a certificate for civil employment.

After serving five years with the colors, noncommissioned officers may reenlist for a term of three years, and on its expiration they may reenlist from year to year until they complete twelve years' service. While thus in reenlisted service the noncommissioned officer receives extra pay ranging from $22 to $43.50, and on discharge he receives, in addition to his certificate for civil employment, a bonus of $400.

The law regulating the appointment of noncommissioned officers to civil appointments dates from July 8, 1883, and reads as follows:

ARTICLE 1. Underofficers of the army are selected—

(*a*) From corporals qualified for promotion after having served eighteen months with the colors.

(*b*) From the pupils of the special instruction sections and from those of the other corps who have successfully passed the prescribed course for promotion to sergeant.

(*c*) From the cadets of the military school or military academy who have failed to pass the necessary examination for appointment as a second lieutenant at the termination of the second or third course, provided the subjects failed in are not of a military nature.

[1] From the report of Col. L. V. Swaine, British military attaché at Berlin.

The following are enrolled with the grade of sergeant:

(*d*) Reserve officers who have resigned their commissions as laid down in article 7 of the law, June 29, 1882, No. 830.

(*e*) Those who, in accordance with paragraph (*d*) of article 1 of the above-quoted law, were not appointed reserve sublieutenants.

(*f*) One-year volunteers who have passed the examination qualifying them for the grade of sergeant.

(*g*) Corporal-majors who on discharge from the colors are promoted sergeants.

(Articles 2 to 9 and 11 to 13, both inclusive, have been replaced by the corresponding provisions of the recruiting law of the army, as follows):

ART. 124. Noncommissioned officers of the various arms contract to serve five years. * * *

ART. 125. Having completed their enlistments, all men of the first category are, in time of peace, sent on unlimited leave, remaining on the rolls of the permanent army. * * *

The noncommissioned officers of the various arms * * * pass in the eighth or ninth year of service to the mobile militia, to which they remain assigned to the 31st of December of the twelfth year of their service. * * *

REENLISTMENT WITH SERVICE PAY.

ART. 148. Noncommissioned officers of the various arms, who are judged worthy, may aspire to a reenlistment with service pay. * * *

They may contract a reenlistment of three years after completing five years of service with the colors, and at the expiration of this reenlistment they may contract four successive reenlistments of one year each, carrying service pay.

ART. 149. If, at the end of the first, second, or third reenlistment, or on account of the cancellation of his reenlistment, a noncommissioned officer goes on unlimited leave, he remains assigned to the mobile militia until the men of his own class pass to the territorial militia.

ART. 150. During the first reenlistment a noncommissioned officer receives an annual service pay of 109.50 lire.[1]

During his successive reenlistments his annual service pay is 219 lire.

ART. 152. A noncommissioned officer loses his reenlistment service pay only when he is at a military school with a view of obtaining promotion to the grade of second lieutenant, or when he is under suspension.

ART. 153. On reenlisting with service pay a noncommissioned officer receives no bounty in cash, but there is allowed to him, by way of indemnity, the sum of 100 lire for his own individual fund.

ART. 154. Having completed twelve years of service with the colors, a noncommissioned officer is allowed, once for all, an indemnity of 2,000 lire, bearing in mind the exception laid down in the following article:

(This indemnity is allowed and paid whether the noncommissioned officer remains with the colors or not.)

A noncommissioned officer of the train who remains with the colors up to the end of his sixteenth year of service has a right to an additional indemnity of 1,000 lire.

ART. 155. A noncommissioned officer who is promoted to the rank of second lieutenant in the royal army after completing eight years with the colors receives, once for all, an indemnity of 500 lire, increased by as many times 200 lire as he has years of active service in excess of eight.

In no case may this indemnity exceed 2,000 lire.

ART. 156. The noncommissioned officer reenlisted with service pay who becomes unfit for service before completing twelve years' service, and who consequently has no right to a disability pension or retiring pension, receives, once for all, an indemnity equal to as many times 300 lire as he has completed years of reenlistment.

(Article 14 of the law on the position of noncommissioned officers has been repealed. The military chest no longer provides for the payment of reenlistment bounties, service pay, and indemnities. All such payments are now provided for in the annual budget.)

ART. 10. The underofficer who has completed twelve years' service with the colors is entitled as a right to a situation of, as a minimum, 900 lire per annum in one of the Government offices, railway companies, or such other private establishments where Government may stipulate that situations should be reserved.

ART. 15. The underofficer unwilling to enter the civil service, and preferring to remain in the army with the colors, may do so, if qualified and deserving, on the termination of his twelve years' service.

With this view he may enter into a series of one-year engagements, receiving an annual extra allowance of 365 lire until he is discharged.

After twelve years' service the underofficer is entitled to be promoted to the rank of color-sergeant; after sixteen, to that of sergeant-major, provided there is a vacancy.

In all cases they receive the pay of the grade.

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[1] One lira equals 1 franc, or about 20 cents American.

The underofficer who, after completing twelve years' service with the colors, fails to obtain employment in the civil service, may be retained in the army, in which case he will be entitled to all the emoluments, etc., due to those underofficers who have elected to remain in the army in preference to entering civil employment.

ART. 16. The war minister will grant to underofficers electing to remain in the army after the termination of their twelve years' service, every facility, provided they do not interfere with the interests of the service, and even the permission of marrying without the necessary legal income.

ART. 17. Above-mentioned underofficers employed in services nsually filled by local clerks, or assistants, will eventually fill such posts as vacancies occur.

ART. 18. Underofficers' claims to pensions commence after twenty years' service with the colors, independent of age.

ART. 19. The reduction of underofficers can only be carried out by the war minister in accordance with rules laid down by royal decree.

ART. 20. The employments and situations reserved for underofficers, as per article 10, are as follows:

(*a*) All local clerks and assistants, engineers' assistants, office-keepers' attendants, care takers, and similar posts, in all departments dependent on the war minister.

(*b*) In all other public offices of the State one-half of the vacancies occurring in the posts of second-class clerks, storekeepers, hall porters, custodians, messengers, etc., with salaries varying from 1,200 to 900 lire a year.

In the war office situations of second-class clerks are all reserved to local clerks.

In the other State offices only half the appointments are reserved.

(*c*) In the railway companies one-third of the vacancies occurring among the clerks, care takers, guards, etc., with salaries varying from 1,200 to 900 lire per annum.

The liabilities of the companies shall be specially noted in the covenants made with the associations working the railway lines.

A proportionate number of vacancies in the appointments mentioned in paragraphs (*b*) and (*c*) shall be allotted to petty officers of the royal navy who have completed twelve years' service, preference always being shown to the same when a vacancy occurs in a department dependent on the minister of marine.

ART. 21. Applicants for the situations above mentioned are expected to possess the necessary qualifications to fill them.

ART. 22. In a special regulation which will be issued by royal decree, after having previously been submitted to a committee of members of the House of Senate and Chamber of Deputies, together with superior officers of the civil service, the number of vacancies to be reserved to underofficers of the army shall be fixed agreeable to article 20, and the rules for nomination to the situation shall also be therein stated.

ART. 23. Underofficers who are allowed to reengage under the regulations of this law, but who are eventually transferred to the corps of veterans and invalids during their term of service, shall be entitled to the extra pay they were receiving when transferred, and also during the time they remain with the corps.

ART. 24. Emoluments and extra pay as fixed by this law can not be alienated or sequestered.

ART. 25. The war minister shall annually lay before Parliament, at the same time as the budget, a statement of the appointments granted to underofficers during the preceding year.

ART. 26. The underofficer who, as ruled by this law, has been provided with a situation in a railway or similar company, where by special covenant posts are reserved for underofficers, shall be paid from the military chest, on the termination of his first year of service, a bonus of 600 lire as a pension quota for twelve years spent with the colors.

If pension chests for the benefit of the personnel exist, the underofficer may pay into the chest a quota proportionate to the number of years he has spent in the army, being within the proportionate limits of the payments made for the same number of years by his colleagues in the same administration.

ART. 27. Underofficers who are appointed to such posts shall be subject to the same discipline and regulations to which other employees of the same class are liable, including the rules and regulations regarding suspension and dismissal.

ART. 28. This law shall come into force on January 1, 1884.

SPECIAL AND PROVISIONAL REGULATIONS.

ART. 29. Except that, as is laid down in article 18 and article 23, all other regulations as ruled by the present law are not applicable to the underofficers of the corps of royal carabinieri, of the veteran and invalid corps, military penal establishments, discipline companies, remount establishments, bandmasters, and corps of armorers.

For the underofficers of the above services the previous regulations remain in force, including those regarding reengagements with a gratuity, as stated in article 137 of the law on recruiting.

Such engagements are also applicable for the privates of the carabinieri, and also for private soldiers of other branches of the services who are allowed to reengage, although not underofficers.

ART. 30. With the exception of the Corps of Royal Carabinieri, all other underofficers shall be entitled to an increase of 0.30 lire per diem in place of the annual gratuity of 150 lire, which is abolished.

ART. 31. Underofficers reentering the service under the stipulations of article 3, irrespective of the number of years they have served, shall not be allowed to be candidates for employment before they have completed fourteen years with the colors.

ART. 32. The regulations as laid down in article 2, regarding the underofficers' term of service, shall be enforced on all those underofficers who may be promoted after January 1, 1883, or to those attached to instruction sections on the date of the proclamation of this law.

All other underofficers shall be liable to the usual contracts of service entered on.

ART. 33. All rights previously obtained on reengagements with gratuity are maintained, with the exception of the case mentioned in article 36.

ART. 34. Underofficers usually serving with the colors without having reengaged with a gratuity shall be paid monthly the difference between the increased pay mentioned in article 30 and the actual gratuity.

On the completion of their term of service the regulations of the present law shall be enforced unrestricted; they may then reengage for one year for four successive years, as laid down, with a gratuity of 100 lire and an annual allowance of 219 lire.

ART. 35. Underofficers reengaged with a gratuity shall be paid the annual premiums as before, and monthly the difference between the increased pay and actual gratuity, as laid down in article 30.

On the termination of their reengagement they may reengage successively for one year at a time without extra pay, so as to entitle them to a pension or to a situation in the civil service. They will not, however, be awarded a post in the civil service until they have served fourteen years with the colors, or until two years have expired after the termination of their reengagement.

The underofficers who claim their discharge after twelve years' service with the colors may become candidates for civil employment, but at the rate of one-fifth of the vacancies.

ART. 36. Underofficers reenlisted with a premium, or reengaged with a premium, shall always have the option of being treated under the regulations established by this law; if so, they shall relinquish absolutely the privileges attached to the present enlistment or reengagement, and then only will they be entitled to the extra pay fixed by this law, and according to the year of service in which they are when they declare their option; they shall, in addition, be entitled to all the privileges laid down in the present law for obtaining civil employment, claim to be pensioned, and payment of extra allowances.

ART. 37. An underofficer who retires or is promoted to a sublieutenancy, and who is a creditor of capital due for reengagements with a gratuity, previously obtained or already settled, and similarly the underofficer enjoying a pension, shall have no claim to the indemnities mentioned in article 11, article 12, and article 13.

Underofficers, however, who have reengaged under the present law, shall be entitled to a gratuity of 300 lire per annum for every year completed in such reengagement.

ART. 38. The regulations stated above, and laid down in this law, do not impair existing rights of applicants for civil employment before the publication of this law, provided such claims do not imply a transfer from other administrations to the war office.

We hereby decree that the present law, duly sealed, be inserted in the laws of the Kingdom of United Italy, and ordain that all concerned shall obey it as a law of the State.

HUMBERT.

FERRERO, *War Minister.*

Field Range Finders.

AUSTRIA-HUNGARY, BELGIUM, ENGLAND, FRANCE, GERMANY, ITALY, AND RUSSIA.

In the following notes are enumerated and described, as far as known, the field range finders actually in use in the various European armies. The descriptions have been taken, whenever possible, from official sources, supplemented occasionally by unofficial descriptions and notices, trade advertisements, etc. Considerable use has been made of the article on range finders by Capt. A. H. Russell, Ordnance Department, which appeared in Ordnance Notes No. 170, of 1881.

In a subsequent number it is intended to describe, as far as possible, the systems of range and position finding used for coast defense in Europe.

AUSTRIA.—THE INFANTRY RANGE FINDER.

THE ROKSANDIC RANGE FINDER.

Theory of the instrument.—Given two mirrors, I and II, making with each other an angle of 45°. A ray from object O falling on mirror I is reflected in the direction I II to the mirror II, and thence in the direction II A into the observer's eye. The angle inclosed by the reflected ray II A and its original direction IO is double the angle inclosed by the mirror surfaces. The former, therefore, in this case is a right angle.

If the angle made by the mirrors be increased by an angle α, the angle between the reflected ray and its original direction IO must be $2(45+\alpha)=90+2\alpha$, and the ray is reflected in the direction A D, which, with A II or A D, incloses the angle 2α.

Now, if the reflected ray A D is to be given its old direction without changing the mirror angle $(45°+\alpha)$, the instrument has to be displaced so far toward D that the incident ray and A D inclose an angle of $90+2\alpha$. In assuming, therefore, the angle aOC$=2\alpha$, the instrument would have to be transferred from a to C.

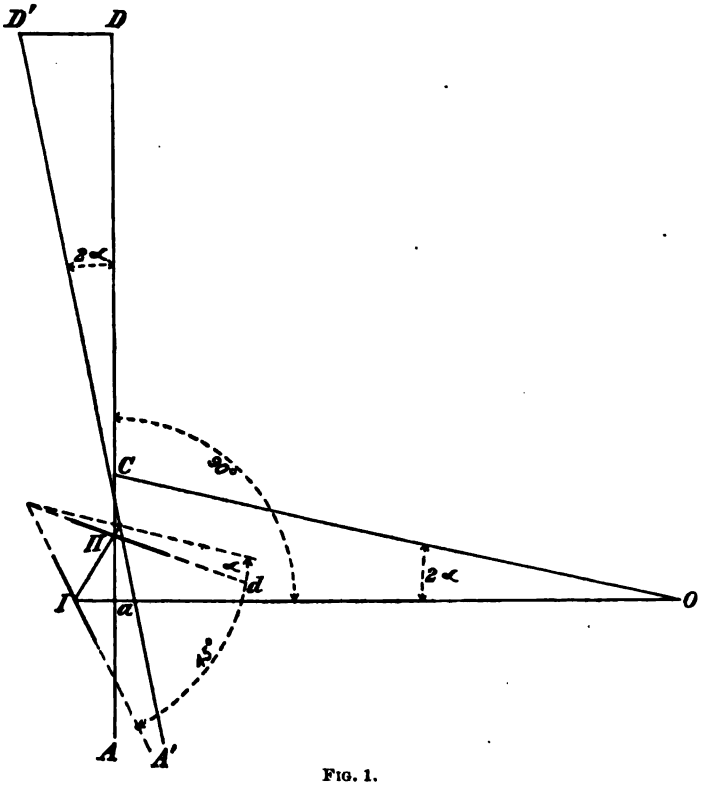


FIG. 1.

We thus get a right-angled triangle aCO, of which, besides the acute angle 2α, the short side aC (the base) is known; the other side aO can now be found.

Construction.—The important parts of the instrument are fixed to a brass base plate P (fig. 2), and inclosed by a brass case G. Two plain steel mirrors I and II are each screwed to a mirror arm. The rearward mirror arm R is cast in one piece with the base plate. On its extremity, which projects through the right side of the casing, there is a female screw thread for screwing in a handle H, a second female screw thread being on the anterior face of this part for the binding screw *e*.

The anterior mirror arm V is also of brass, and pivots on the steel pivot *x*, over which it is slipped and held in place by a pin. The pivot is perpendicular to the base plate and screws into it.

At the other extremity of this mirror arm, which is split, there is a trigger D, and above the latter a stop screw *a*, which may be fixed in any position by the clamp screw *k*.

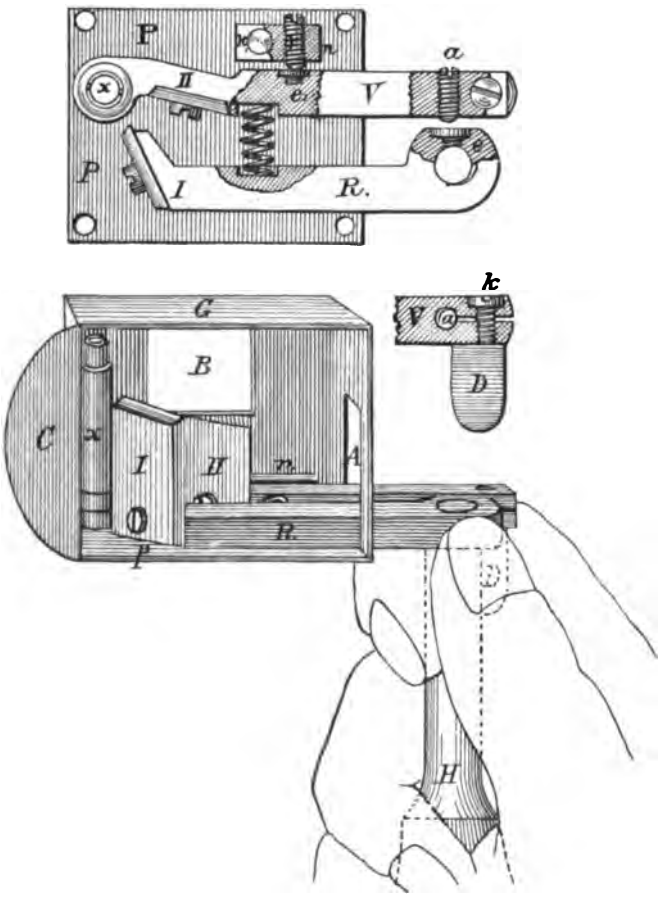


FIG. 2.

The two mirrors are held apart by a spiral spring of brass, whose ends are inserted in corresponding recesses of the arms.

Fixed to the base is also a split block *n*, which serves to receive the adjusting screw *r*, which is of steel. The latter may be fixed in any position by a clamp-screw *k*, which is screwed in from below.

Lastly, there is a binding screw *e* in the anterior mirror arm opposite the adjusting screw.

The casing G, which serves to protect the mirrors and exclude superfluous light, is fastened to the base by four screws. On the right side a piece A is cut out, through which the rays from the object O on the right reach the mirror I; in the anterior wall there is a window B through which the foreground can be seen, and below is a hole for the head of the adjusting screw.

From the rearward edge of the left-side wall there springs a curved projection C, which, when the instrument is used, fits against the nose. To the rear the casing is open. The handle H is of wood, reenforced at its upper end by a brass ferrule ending in a screw. Each instrument is provided with a leather-covered wooden case which is slung over the left shoulder by means of a strap.

Use of the range finder.—When the anterior mirrorarm is pressed against the rear mirror arm by means of trigger D, the planes of the mirrors inclose an angle of 45°. When the trigger is released, the anterior mirror arm is pushed forward by the spiral spring until the bindings crew *e* touches the adjusting screw *r*. In this position the mirror planes inclose an angle of 45° 34.4′.

Stand so as to have the object O on your right; grasp the instrument by the handle with the right hand, point of thumb against the mirror arm R and the middle joint of the forefinger against the trigger D, the projection C against the right side of the nose, right hand resting against the cheek and the right arm against the body. Press the two mirror arms together (making an angle

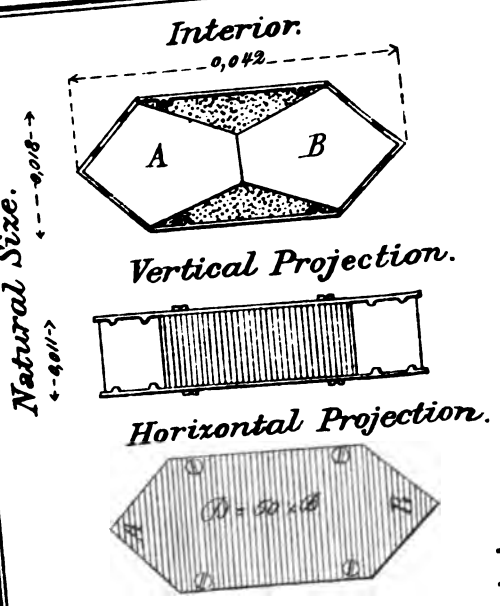


Fig: 2.

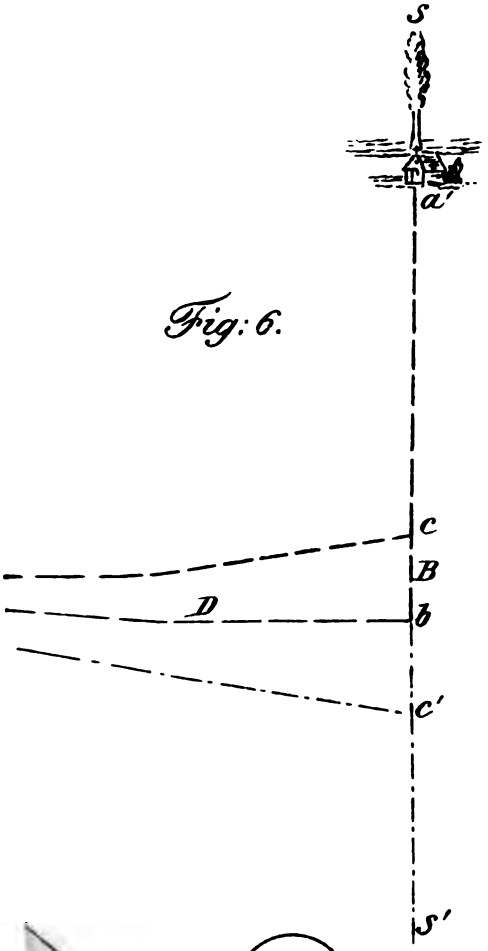


Fig: 6.

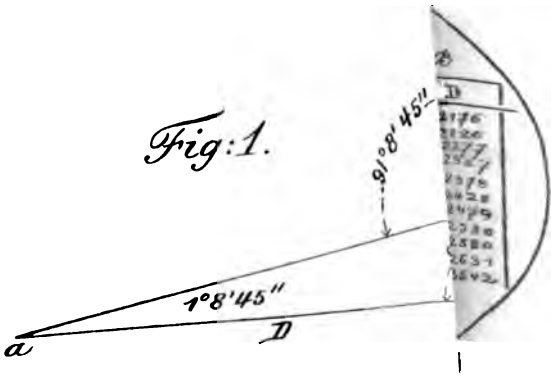
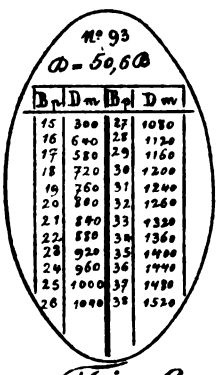


Fig: 1.



Nº 93
D = 50,6 B

B	D m	B	D m
15	300	27	1080
16	640	28	1120
17	580	29	1160
18	720	30	1200
19	760	31	1240
20	800	32	1280
21	840	33	1320
22	880	34	1360
23	920	35	1400
24	960	36	1440
25	1000	37	1480
26	1040	38	1520

Fig: 8.

THE HENRY PETERS CO., PHOTO-LITHO., WASHINGTON D. C.

of 45 degrees). Object O is now seen in mirror II in a direction at right angles to O*a*. Have a stake D (see fig. 1) planted in the apparent direction of the image of O (looking over mirror O through window B, fig. 2), and stretch tapeline from your position toward that stake. Release the mirror arm and walk forward until the image of O and the stake D (see fig. 1) again coincide. The distance you have stepped off is 1:50 of the distance to O.

RANGE FINDING IN THE FIELD ARTILLERY.

The Austrian field artillery does not use range-finding instruments. The distances are estimated, and are then corrected by means of the "fork."

BELGIUM.—THE INFANTRY TELEMETER.

THE STROOBANTS TELEMETER.

Fig. 2, plate, gives a full-sized drawing of this instrument, which consists of two pentagonal prisms inclosed in a casing of blackened copper so as to leave the faces forming the right angle of each prism uncovered.

Prism A (fig. 3) is constructed so that the angle at *r* is a right angle and the faces *mn* and *pq* inclose an angle of 45 degrees. Rays from an object *a* will, therefore, after undergoing double reflection by the faces *mn* and *pq*, strike *rm* normal, and the image of *a* will be visible in the direction of *a'*. This prism may therefore be used for establishing a right angle.

The prism B (figs. 4 and 5) is constructed like A, with the exception that the faces *mn* and *pq* inclose an angle of 45° 22′ 55″. Rays from an object *a* entering the prism normal to *pr* will therefore undergo double reflection from the faces *mn* and *pq*, as in prism A, but, not arriving normal to *rm*, will suffer refraction, the angle *alt* (or *rdt*) being equal to 2×45° 22′ 55″, i. e., 90° 45′ 50″; the angle *rds* (or *acs*) will be 91° 8′ 45″, depending on the index of the refraction of the glass, and the image of *a* will appear in the direction of *a'*.

Application.—Establish a right angle by means of prism A, and mark same by a stake or other object; then from the same point, looking through prism B, advance toward the signal chosen until signal and image of target again are seen to coincide. Measure the distance so passed over, find the number of units in column B of the table of distances, and the figure opposite in the adjoining column D will be the distance sought. If D represents the distance to target, B the base, and *a* the angle at vertex of triangle, the formula is $D=B\times\frac{1}{\tan a}$.

Use of the instrument (*fig. 6*).—Standing at *b* the observer wishes to find the distance *ab*.

Stand at *b* so as to have *a* on your left; take the instrument between thumb and forefinger of the right hand, one face of the right angle of prism A toward the object, the other toward the eye, the fingers holding the instrument about the middle. The object is now seen in the direction *a'*, and should coincide with some clearly visible object seen in the distance over the top of the instrument. If there is no such object, move to the right or left, or forward or back, until some plainly visible object becomes available as signal S.

Reverse the instrument, look through prism B, and advance from *b* toward S, along the straight line connecting the two, until the image of *a* and the signal S are again seen to coincide. Measure *bc* and find the distance *ab* in the table of distances.

Or you may stand at some point *c* and establish the signal S by means of prism B; then reversing the instrument and walking backward to some point *b*—looking meanwhile through prism A—establish point *b*, and thus the distance *bc*, by means of which *ab* may be found.

The normal coefficient, $\frac{1}{\tan a}$, is 50; but as it is impossible in the construction of the instrument to get the angles of the prisms exact, and as the refraction of the glass also varies somewhat,

a separate table is made for each instrument. The coefficient thus found experimentally for each instrument is engraved on the casing.

To avoid damage to the exposed faces of the prisms of the telemeter, which are liable to be nicked by objects that would be habitually carried in the pocket, and to keep these faces from getting dirty or losing their polish, the telemeter is provided with a metallic box with a cover. The instrument fits snugly in this box, which is also used for carrying the tables. These are sometimes pasted to the inside of the cover and the bottom of the box.

The Stroobants telemeter is claimed to be the very lightest known. It is certainly lighter and smaller than the Souchier prism telemeter. There is absolutely nothing to get out of order. It is always correct, can be used by anyone of ordinary intelligence, and is perhaps the cheapest range finder actually in use.

RANGE FINDING IN THE FIELD ARTILLERY.

Range finders are not used in the Belgian field artillery. Ranges in the field are first estimated, and corrections are made by means of the "bracket" or "fork."

ENGLAND.

FIELD ARTILLERY RANGE FINDERS.

The range finders in the service for horse and field artillery are (1) the Watkin field range finder and (2) the Watkin field telemeter. Their application is at present restricted to objects seen by daylight, and, except under special circumstances, to the observation of stationary objects.

PART I.—THE WATKIN FIELD RANGE FINDER.

The instrument is double reflecting, on the principle of the common sextant, but is so constructed that the distant object is seen by direct vision, and the near one by reflection. It weighs about 4½ pounds. Its parts are as follows: The metal case, the cylinder, the cylinder guide collar, the cylinder band, the base bar and sliding collar, the base-bar spring, the steel bar, the steel-bar spring, the index glass, the short arm, the horizon glass, the rack and pinion, the rack knob and spring slide, the regulator, the regulator blocks, the adjusting key, the telescope, the two eyeholes with sliding shutters, one for each eyehole.

The cylinder consists of a metal barrel with a steel-pointed screw rigidly fixed in it. The screw works in a split-spring guide collar, its point bearing upon a steel block at the end of the base bar. The cylinder has engraved upon it spirally a scale of ranges from 450 to 5,000 yards, which are read by means of an arrowhead upon a fixed band which partly surrounds the barrel. The cylinder has a zero mark to show when it is fully screwed up.

The base bar is of gun metal, and has a scale of bases engraved on it from 60 to 130 yards; the scale is read by means of a line cut on the sliding collar. The bar is compelled to move with the cylinder, being pushed forward by it in one direction, and constrained by the base-bar spring to follow it in the other.

The steel bar conforms to the movement of the base bar, being pushed forward by it in one direction, and constrained by the steel-bar spring to follow it in the other.

The index glass, which is entirely silvered, is fixed in a frame at the pivot end of the steel bar. The glass has necessarily a movement dependent upon that of the steel bar.

The horizon glass and short arms. The glass is half silvered and set in a metal frame fixed to the short arm. It has two positions:

1. When the regulator is pressed against the side block K (Pls. I and II); it is then at 45° inclination to the index glass.

2. When the regulator is pressed against the center block L; it is then parallel to the index glass.

The horizon glass is shifted from one position to the other by the rack and pinion, actuated by the rack knob. Back lash is avoided by a bent spring under this knob.

The regulator and regulator blocks.—The regulator is a small screw of hardened steel carried on the end of the short arm, from which it projects in both directions; the arm plays between the steel regulator blocks. The position of this screw can be slightly altered by the adjusting key without any alteration in the total angular traverse of the short arm carrying the horizon glass. Thus, if the short arm be locked in position so that the regulator bears against the block L (Pls. I and II), then by screwing or unscrewing the regulator the horizon glass can be brought exactly parallel to the index glass, and by this method the instrument can be tested and adjusted.

The sliding collar can be set in any position on the base bar from the 60 graduation to the extreme end. Its function is to communicate a motion to the steel bar from the base bar, the motion being proportional to the length of the base to which the collar is set. When the cylinder is at zero the steel bar and base are absolutely parallel, and the movement of the sliding collar along the base bar imparts no movement to the index glass.

The amount of motion of the cylinder to give a definite movement to the index glass depends on the position of the sliding collar. By setting this collar to the proper graduation for the base used the range in yards can be read direct from the scale on the cylinder.

The sliding shutters have eyeholes in them and should be closed when the telescope is not used. An observation taken with the shutters open can not be depended upon.

The telescope is focussed by moving the eyepiece, and magnifies four times. For use, it is inserted into the eyeholes, the shutters being withdrawn.

The steel tape is a ribbon of steel 20 feet long with a loop at one end for fixing to a button on the A picket, the other end being fastened to the interior of a case into which the whole ribbon can be wound. There is a raised mark on the tape indicating a length of 6 yards. The tape is employed to test the length of the metallic cord.

The metallic cord is composed of a silk line 18 feet 9½ inches long, and covered with copper wire. One end is fixed to a wooden shuttle on which the cord is wound; the other is furnished with an S hook which enables the cord to be attached to the button of the A picket. A length of exactly 6 yards is marked off by a single knot on the cord on the outside of the hole in the shuttle, the measurement being from this knot to the outside bend of the hook.

The tripod pickets are of ash, each consisting of three legs and an upright, and carrying a little flag.

USE OF THE INSTRUMENT.

In order to take the range with the Watkin range finder from any point P to any object O (fig. 1), it is necessary that a position may be found to the right or left of P from which both O and P are visible, and at which point Q may be marked so that either the angle OPQ or the angle OQP shall be a right angle. The procedure in taking the range is as follows (figs. 2 and 3): Place a picket at P, find the right-angle point Q by means of the instrument, and place a second picket there. Standing at Q, read with the instrument the base PQ by means of a sub-base PR marked by picket R at right angles to PQ. Set off the base so found on the base bar of the instrument, proceed to P, and taking an observation read the range OP on the graduated cylinder. The operation thus consists of (1) fixing the right angle, (2) finding the base, and (3) taking the range.

1. FIXING THE RIGHT ANGLE.

Set the cylinder at zero, the rack knob at "range-right angle" (setting the mirror at 45°), and the sliding collar at the stop. Look through the end eyehole marked for right angle and range.

Let O be the object and P the point from which the range to O is to be found (fig. 3). Place yourself at any point, say Q′ or Q″. Look at O through the unsilvered portion of the horizon glass. The image of picket P will now appear reflected in the silvered portion of the glass toward P′ or P″ at right angles to PQ′ or PQ″ (figs. 4 and 5).

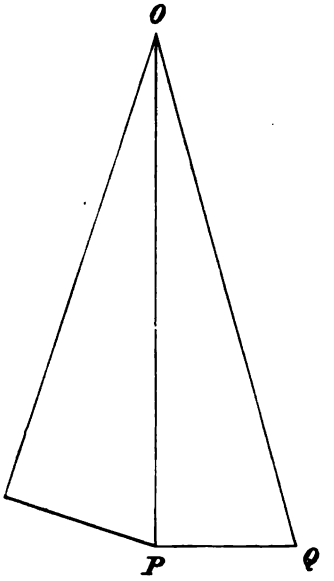


FIG. 1.

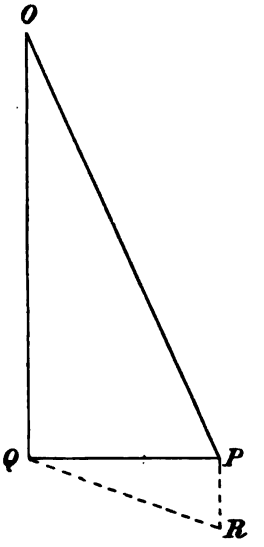


FIG. 2.

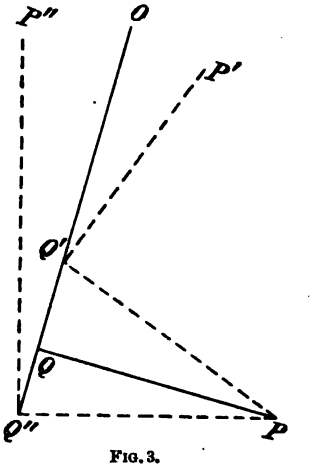


FIG. 3.

Advance or retire, as the case may be, until object O and image of picket P coincide in the glass. This will fix the right angle (fig. 6).

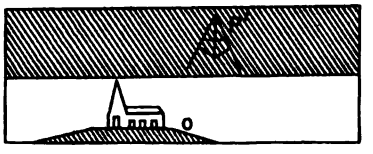


FIG. 4.

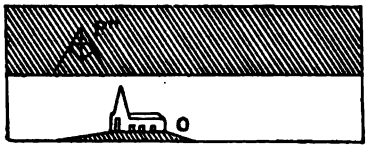


FIG. 5.

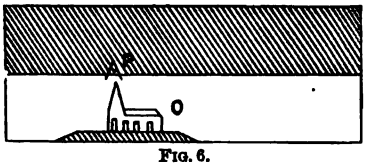


FIG. 6.

2. FINDING THE BASE.

The initial point P and the right-angle point Q have each been marked by a picket. By means of process just described and the metallic cord (6 yards in length) establish point R (fig. 13) and mark with picket, PR forming a right angle with QP and measuring 6 yards in length. Turn the cylinder to zero, push rack knob to "base" (setting mirrors parallel), and set off length of sub-base—6 yards—on base bar. Stand at Q facing QR, hold instrument over picket Q, look through eyehole marked "base." The reflected images of P and R will now appear immedietely under their natural ones in the horizon glass (fig. 10). Revolve cylinder until reflected image of R coincides with natural image of P, and read distance of PQ on cylinder scale.

When the cylinder is at zero the glasses are parallel and the images coincide. When the cylinder is revolved the index glass is displaced and reflected image thrown to one side to an extent proportional to the number of revolutions given to cylinder. The sub-base PR (fig. 8), being fixed at 6 yards, the smaller PQ is the greater becomes the required movement of the index glass—the amount of movement being registered by the scale on the cylinder and being a measure of the distance PQ.

3. TAKING THE RANGE.

The length PQ having been ascertained as just described, set off that distance on the base arm; otherwise, set instrument as for finding right angle and place it upon picket P so that ring marked on bottom of case coincides with head of picket.

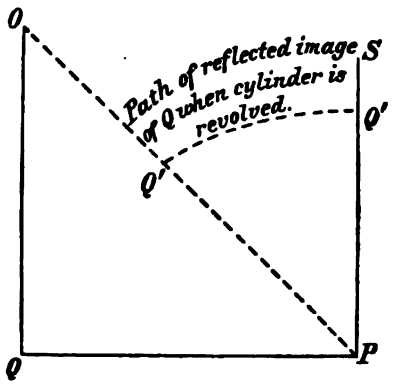


FIG. 7.

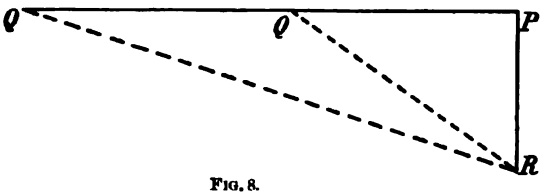


FIG. 8.

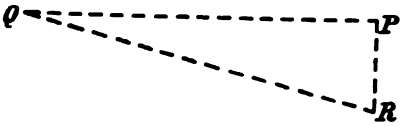


FIG. 9.

Look through the eyehole marked "range-right angle." Image Q′, of picket Q is seen reflected at right angles to PQ in a direction S to the right of O (figs. 7 and 8). Revolve the cylinder, making Q′ move toward O until reflected image Q′ coincides with O, which latter is seen direct.

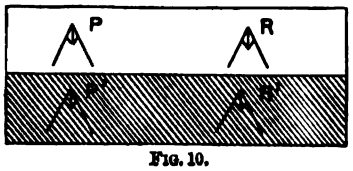


FIG. 10.

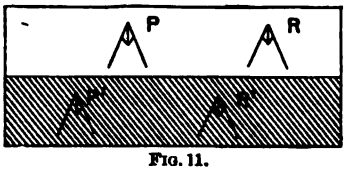


FIG. 11.

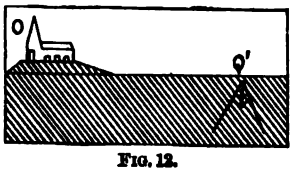


FIG. 12.

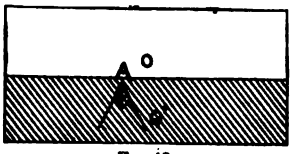


FIG. 13.

In the operation two right angles are established, the mirrors standing at 45° to each other. When the reflected image is made to coincide with object the position of one mirror is changed and its movement made to register the distance on the cylinder, which has a scale engraved on it. To adapt the instrument for various lengths of PQ the base bar is so arranged that the movement imparted to the index glass by each turn of the cylinder is increased or diminished according to the position of the sliding collar. This compensation is approximate, not absolute.

READING THE SCALES.

The scale on the base bar is used for marking a subbase and for marking a base. In the former case the numbered figures only are used, the figures indicating so many yards. In the latter case the subdivisions signify yards and the marked divisions tens of yards, but for convenience these figures are multiplied by ten.

The cylinder scale serves for reading the range and the base. The numbers are read from right to left. Up to the 2,000 yards the scale is graduated for every 10 yards, between 2,000 and 3,000 yards for every 25 yards, and from there upward for every 50 yards. The numbers 450 to 990 denote the actual range in yards, those from 10 to 50, hundreds of yards.

Fig. 16 shows how the usual subbase of 6 yards is set off on the bar scale. If in reading the base the index of the cylinder points as in fig. 14, it is set off on the bar scale without calculation

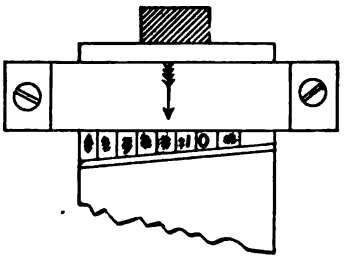


FIG. 14.

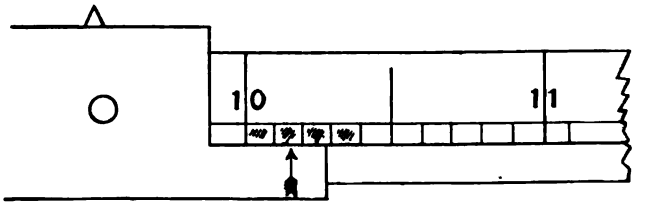


FIG. 15.

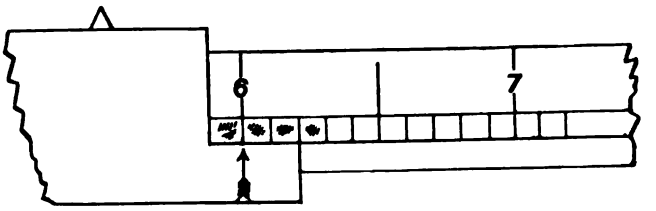


FIG. 16.

as in fig. 15. If in reading the range the index on the cylinder points as in fig. 14, the range is 1,015 yards.

THE MIRRORS.

Let E be the eye looking through the unsilvered part of the horizon glass F at the object O. Let A be the picket, the reflection of which falls first on the index glass N at the angle β and from it passes off at the angle β', and falls upon the horizon glass (silvered portion) at the angle η, and from it again to the eye at the angle η'. Let θ be the angle at which the mirrors are to each other and α the angle between the object and the picket. By the optical law: Angle of incidence = angle of reflection—

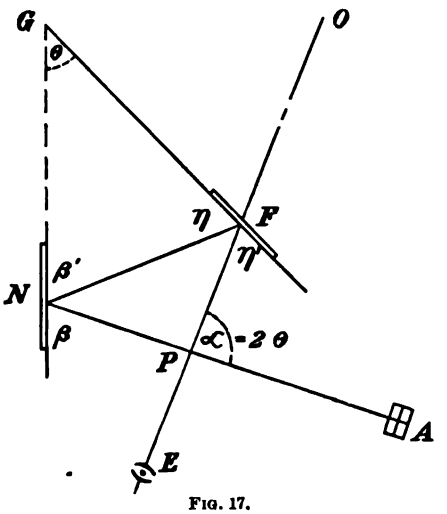


FIG. 17.

$$\beta = \beta'$$
$$\eta = \eta'$$

Now, by Euclid, the exterior angle = the two interior opposite angles. Therefore,

$$\eta' + \text{PFN} = \theta + \beta' = \theta + \beta$$
$$\beta + \text{NFP} = \theta + \eta = \theta + \eta'$$

Adding—

$$\beta + \eta' + \text{PFN} + \text{FNP} = 2\theta + \beta + \eta'$$

That is,

$$\text{PFN} + \text{FNP} = 2\theta$$

But—

the angle α = PFN + FNP

Therefore,

$$\alpha = 2\theta$$

If, then, $\theta = 45°$, $\alpha = 90°$.

PART II.—THE WATKIN FIELD TELEMETER.

THE INSTRUMENT (SEE PLS. III TO VI).

The instrument is double reflecting like the field range finder, the distant object being seen by direct vision, the near one by reflection. The parts are the frame, the cylinder, the cylinder guide rod, the cylinder band, the compensating bar and spring, the setting screw, the screw guard, the base bar, base-bar spring, and sliding collar, the steel bar and spring, the double index glass, the horizon glass, the right-angle pointer, the right-angle and base eyehole with sliding shutter, the range eyehole with sliding shutter, and the telescope.

The frame is fitted with a leather bottom plate having two recesses for the head of the picket corresponding to the range and right-angle eyeholes. The instrument is partly of aluminium, and weighs 2 pounds 15 ounces.

The cylinder, cylinder band, and guide rod.—The cylinder consists of a metal barrel hollowed out and tapped to work on a screw guide rod. The cylinder has engraved upon it spirally a scale of ranges from 450 to 5,000 yards; these are read by means of an arrowhead upon a fixed band which surrounds the barrel. The cylinder has a zero mark to show when it is fully screwed up.

The compensating bar and screw are on the right of the instrument; the bar is pushed forward by the screw in one direction and constrained by the bar spring to follow it in the other. The action of the compensating bar is to move the horizon glass within certain limits.

The steel bar, the base bar, and sliding collar are for all purposes the same as in the field range finder. The base bar is graduated to 140.

The double index glasses which are entirely silvered are fixed in frames at right angles to one another at the pivot end of the steel bar.

The horizon glass is half silvered and fixed in a metal frame in the compensating bar.

The right-angle pointer is attached to the horizon glass, travels over the brass plate, and in combination with a mark on base plate marks the true right angle.

The telescope magnifies four times.

The tape and cords are the same as for the field range finder.

The tripod pickets are the same as for the field range finder, but only two are used.

USE OF THE INSTRUMENT.

The conditions necessary to take the range with this instrument are the same as for the field range finder, but it is not necessary to make an exact right angle. A variation from the right angle is admissible to the extent caused by a movement forward (toward the object) or away from it of one-tenth the base. A deviation exceeding 1 or 2 paces is, however, to be avoided unless greater cover is thereby obtained, as it involves an error in range, the error increasing with the extent of the deviation and amounting to as much as plus 1½ per cent at the extreme limits allowable, which are indicated by the travel of the right-angle pointer, and by the run of the setting screw. The operation of taking the range consists of three operations: (1) Fixing the right angle; (2) finding the base; (3) taking the range.

1. FIXING THE RIGHT ANGLE.

Set the cylinder at zero, the right-angle pointer being set as near as possible to right angle and the sliding collar to the stop on the base bar. Turn down the setting-screw guard. Using right eyehole, make coincidence roughly, plant the right-angle picket as for the field range finder, by means of the setting screw, complete coincidence exactly (without moving the picket), and turn up the screw guard, which should not be touched again till the range has been found.

2. FINDING THE BASE.

A subbase having been marked by the assistant as in range finding with the field range finder (except that picket B is not used), make coincidence between the reflection of the shuttle which marks the end of the subbase, and the object by turning the cylinder, looking while so doing through the right eyehole as before. The reading on the cylinder scale will be the base required.

3. TAKING THE RANGE.

The range is read through the left eyehole at the A picket in the same way as with the field range finder.

The scales are read the same way as on the field range finder.

THEORY OF THE INSTRUMENT.

The general theory of the instrument is the same as that of the field range finder, except in the compensating action of the double index glasses and the method of finding the base.

The compensating action.—Consider the instrument used with the right-angle pointer at zero (both index glasses being at 45° to the horizon glass). Then if O be the object (fig. 18) and AC the

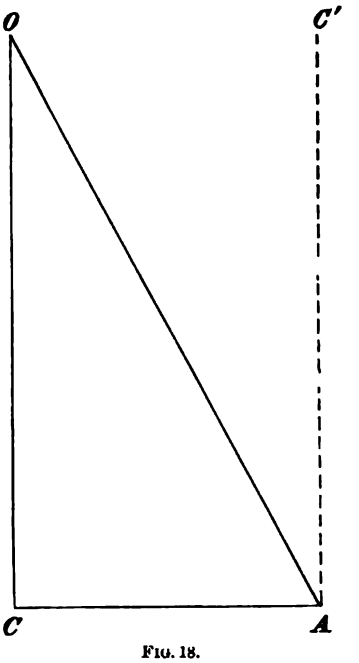


FIG. 18.

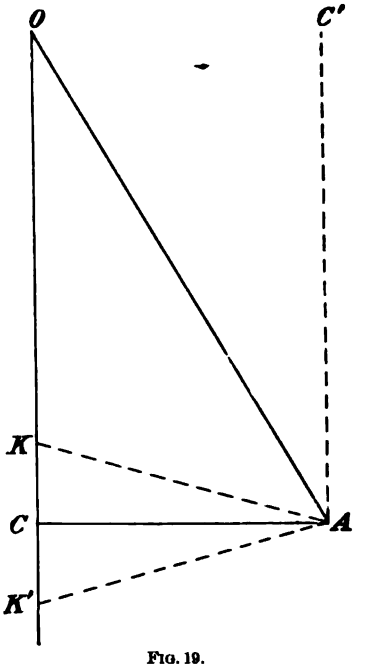


FIG. 19.

base, OCA is made an exact right angle by use of the right eyehole, and CAC′ is made an exact right angle by the use of the left eyehole (the cylinder being at zero). The range, which is approximately equal to CO, is recorded by the instrument as AC, cot. AOC, and is therefore found correctly.

Consider that for convenience the observer has left the exact right-angle position and advanced to K or retired to K′ (fig. 19), and has completed coincidence of A and O by use of the setting screw. The two index glassses are now no longer at 45° to the horizon glass, but the increase in the angle on the one side is exactly balanced by the decrease of the angle on the other side. If, therefore, the true right-angle base AC were set on the base bar, the range recorded by the instru-

ment would be as before—AC, cot. AOC. But instead of AC, the base set is AK or AK′; hence the range recorded is AK, cot. AOC or AK′ cot. AOC, and the error introduced depends upon the difference between AK or AK′ and AC. The error caused by a deviation from the true right angle is always plus.

FINDING THE BASE.

With the field range finder, if AC is the base (fig. 20), and AB the subbase at right angles to AC, the base AC is measured from the point C by setting the horizon and index glasses parallel and then moving the index glass by turning the cylinder until the reflection of B coincides with the image A seen directly. The base so read, therefore, is equal to AB cot. ACB.

With the telemeter, in order to measure AC from C (fig. 21), the glasses are left in the position they occupied when forming the angle OCA until the cylinder is turned to bring the reflection of B upon O. This latter operation increases the angle ACO by the angle ACB, and as before, the base is read AB cot. ACB.

It is to be noted, however, that whereas in finding the base with the field range finder, the triangle ACB may be in any plane, and therefore the subbase AB may be at any angle to the vertical. With the telemeter it is necessary that A, B, C, O be in one plane; hence the subbase AB must be laid out so that the points B, A, O are all in one plane, otherwise the angle OCB will not be equal to OCA+ACB, but will be smaller, an error which will cause the base read to be greater than AC. This error, again, will always produce a plus error in the range found.

The above will explain the circumstance that the field telemeter in the hands of beginners almost invariably reads the range too long.

Although the "Instructions for range finding, horse and field artillery," mention both the Watkin field range finder and the Watkin field telemeter as in use in the field

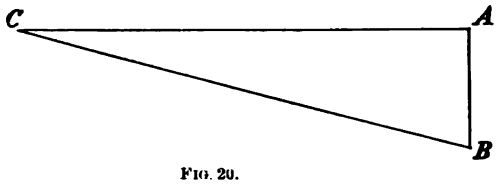


FIG. 20.

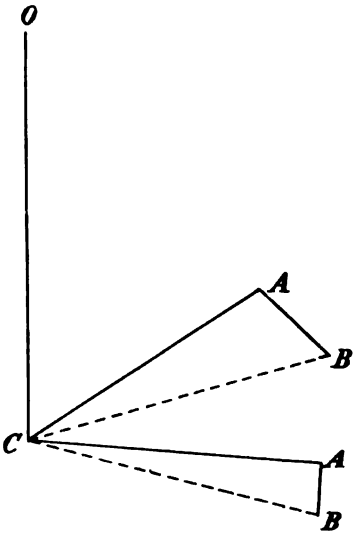


FIG. 21.

and horse artillery, the only instrument prescribed for issue in the "Equipment regulations, 1893," is the telemeter.

It is reported in the Army and Navy Gazette of April 4, 1896, that Col. H. S. S. Watkins, C. B., R. A., has just completed an instrument called the "artillery mekometer," which will supersede the telemeter now in use. The new instrument is to be similar to the infantry and cavalry mekometer, made of brass, and provided with two telescopes instead of one.

INFANTRY RANGE FINDERS.

THE MEKOMETER.

Briefly described, the mekometer consists of a pair of instruments operated by two men, and connected by a specially constructed, pliable, inextensible, waterproof cord, the normal length of which is 25 yards (two 12½-yard lengths), which constitutes the base. Each operator carries one

length of cord, which is provided with a spring catch at each end and is carried, when not in use, on a reel in a leather case attached to the belt on the right side.

These instruments are about 4 by 2½ by 1½ inches in size, and are designated as the mekometer right, which is carried by No. 1, and the mekometer left, carried by No. 2. (See Plate.)

The distant object is viewed by means of a telescope A, direct through the opening B, and the ivory strip on the instrument of the other observer is seen by double reflection through the opening C, the flap F, with the ivory strip attached, being raised. The optical principle on which the instrument is constructed is similar to that of the sextant.

The mekometer left, or No. 2's instrument, is simply an improved form of optical square. No. 2 by advancing or retiring obtains exact coincidence with the ivory strip of No. 1's instrument and the distant object. This having been accomplished, No. 2 calls "On," when No. 1 obtains exact coincidence between the distant object and No. 2's instrument by revolving the drum D opposite the index E. This reading with a 25-yard (2 lengths) base gives the exact range in yards.

In taking the range, with a movable object, No. 2 obtains coincidence with the distant object and No. 1's ivory strip by moving forward or backward, walking to make considerable changes, and moving his body for slight changes in position, calling "On" whenever coincidences are secured. No. 1 secures coincidences as before by turning the drum, but must take the reading at once when No. 2 calls "On."

During these operations the cord is kept taut, as shown in the illustration. If half bases are used, the drum readings are divided by 2; if double bases are used, the drum readings are multiplied by 2 to obtain the correct distances in yards.

All ranges above 1,500 or 1,600 yards should be taken with a double base, or four cords, i. e., 50 yards.

Observations may be taken without using the telescope—a peep-hole sight being provided for this purpose.

The instruments when not in use are carried in leather cases, which are attached to the waist belt on the left side.

Trained observers are said to be able to take any range in fifteen or twenty seconds with these instruments, the instruments being out of the cases and the cords stretched.

After picking out a moving object, five ranges a minute ought to be taken.

Any of the ordinary problems, such as finding the distance between two inaccessible objects, can easily be solved by the mekometer.

THE WELDON RANGE FINDER.

The Weldon range finder is a prism instrument well known in this country. Its description is therefore omitted.

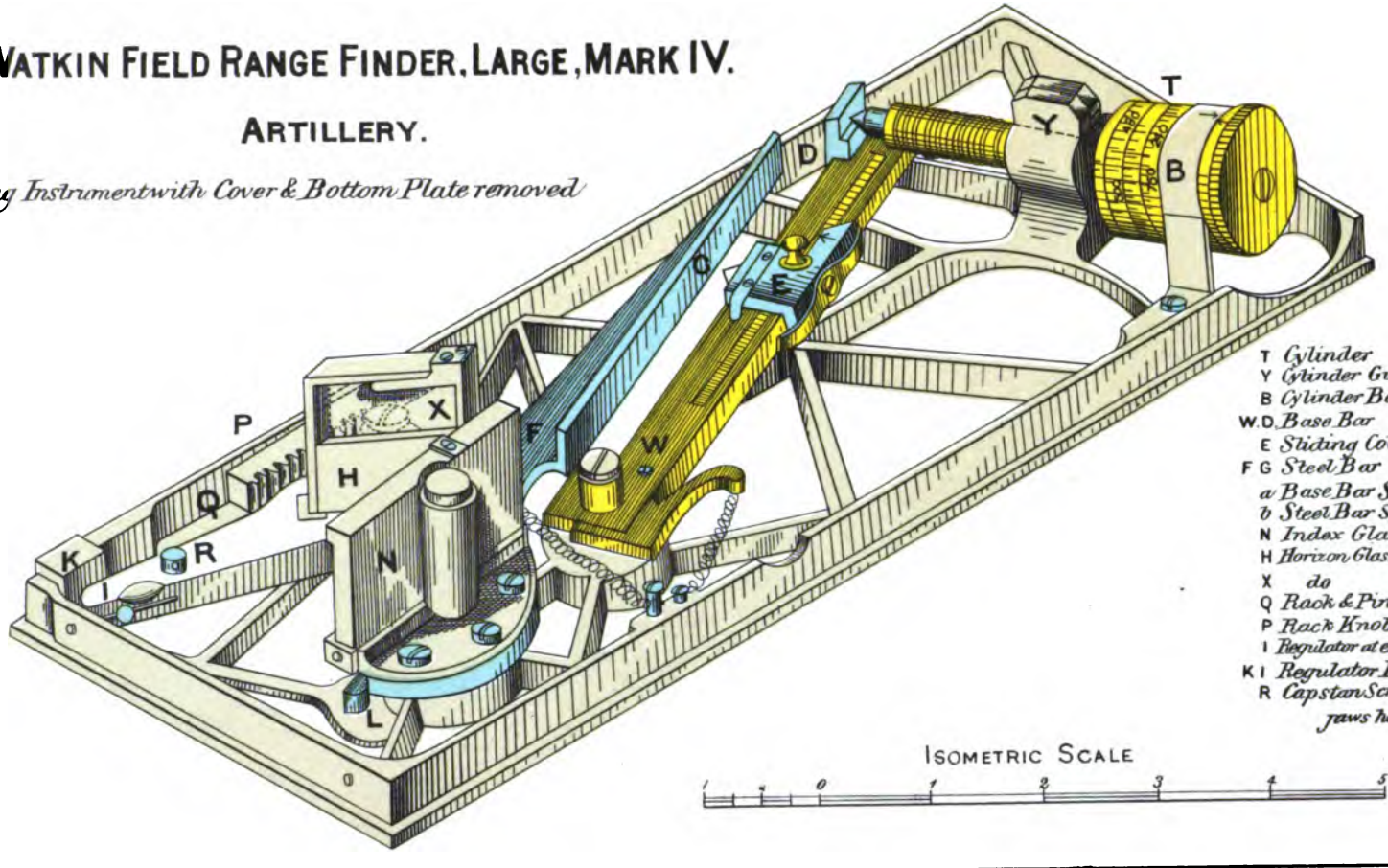
The English also use a stadiometer, the construction and use of which depends on the principle that in similar triangles similar sides are proportional. This is a convenient instrument for use on the drill ground, but it is not suited to battle conditions.

Of the three infantry range finders above described, only one, the mekometer, is prescribed for issue to units in case of war. Four sets, complete, are issued to each infantry battalion and the same number to a mounted infantry battalion. The mekometer is also issued to the cavalry, at the rate of one set for each regiment.

WATKIN FIELD RANGE FINDER, LARGE, MARK IV.

ARTILLERY.

Showing Instrument with Cover & Bottom Plate removed



T Cylinder
Y Cylinder Guide Collar
B Cylinder Band
W.D. Base Bar
E Sliding Collar
F G Steel Bar
a Base Bar Spring
b Steel Bar Spring
N Index Glass
H Horizon Glass Silvered Part
X do Open Part
Q Rack & Pinion
P Rack Knob
I Regulator at end of Short Arm
K I Regulator Blocks
R Capstan Screw to tighten jaws holding regulator

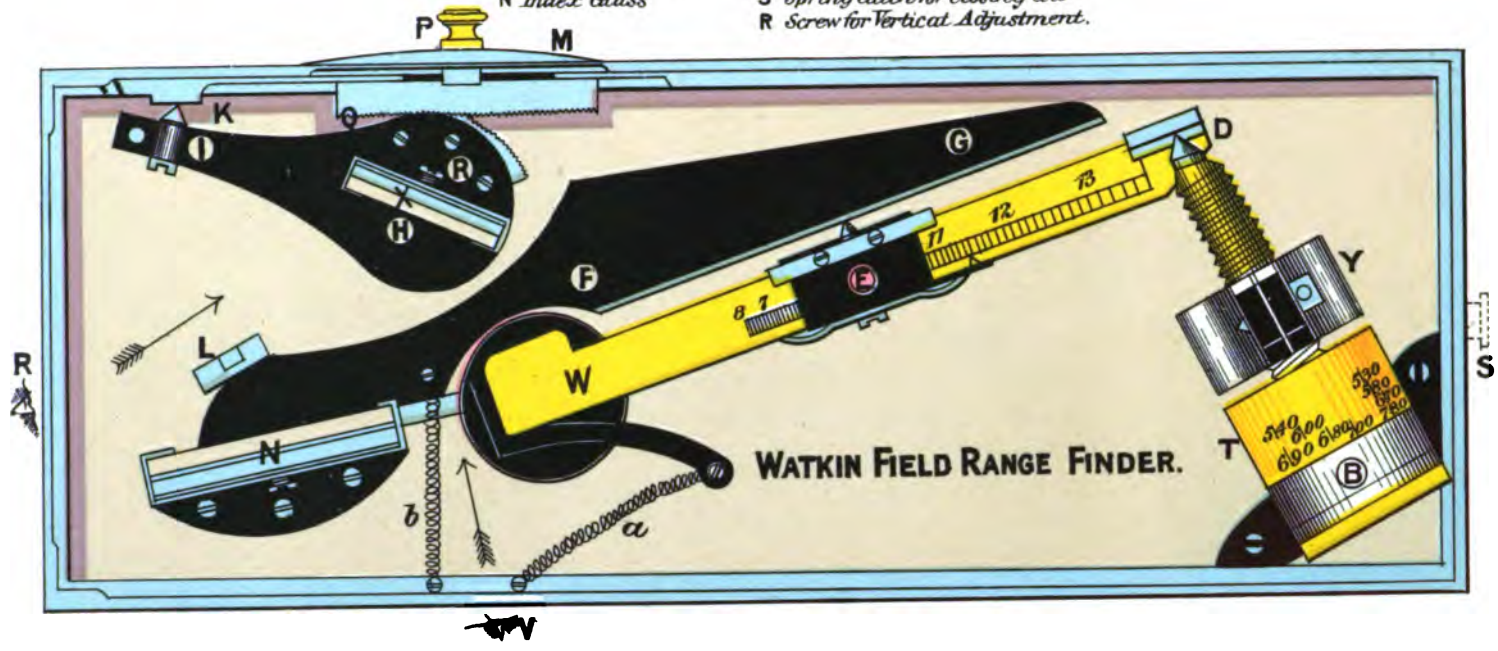
ISOMETRIC SCALE

1 0 1 2 3 4 5 Inches

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON D.C.

T Glinder
Y Glinder Guide Collar
B Glinder Band
W.D Base Bar
E Sliding Collar
F.G Steel Bar
a Base Bar Spring
b Steel Bar Spring
N Index Glass

X. Horizon Glass
Q. Rack & Pinion
P. Rack Knob
M. Spring Slide
I. Regulator at end of short arm H
K.L Regulator Blocks
R End Eyehole (Range Right Angle)
V Side Eye hole (Base)
S Spring Catch for closing lid
R Screw for Vertical Adjustment.

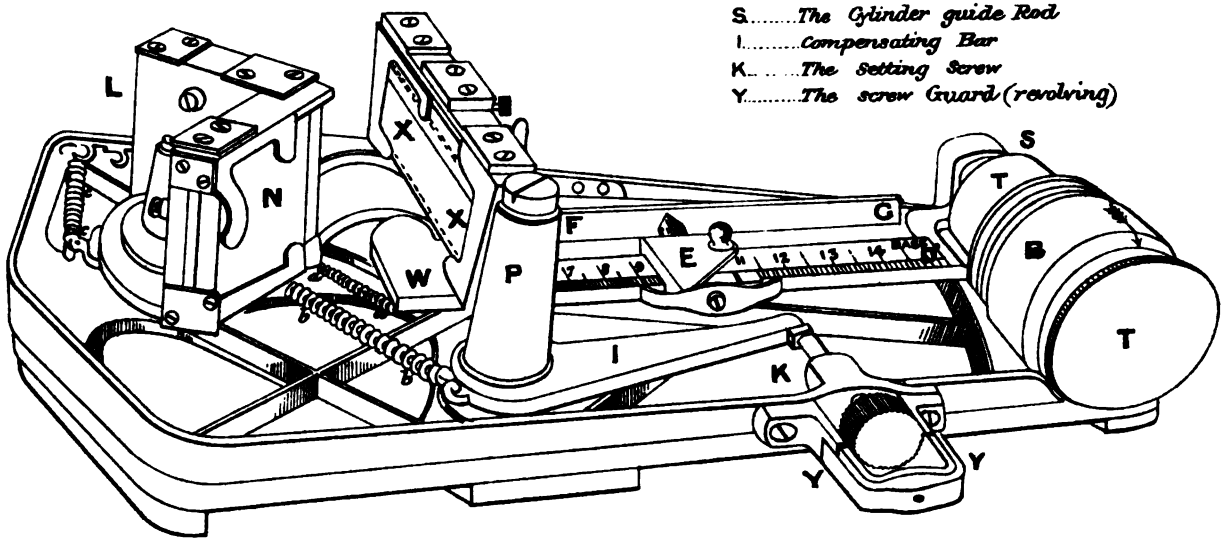


Plan of upper side of Instrument; lid and cover removed.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

FIELD TELEMETER. PERSPECTIVE VIEW. (*Cover removed.*)

T.T.....*The Cylinder.*
B.....*The Cylinder Band*
S.....*The Cylinder guide Rod*
I.....*Compensating Bar*
K.....*The Setting Screw*
Y.....*The screw Guard (revolving)*



W.D....*The base bar.*
E.....*The sliding collar*
F.C....*The steel bar*
X.X....*The horizon glass*
L.N....*The index glasses*

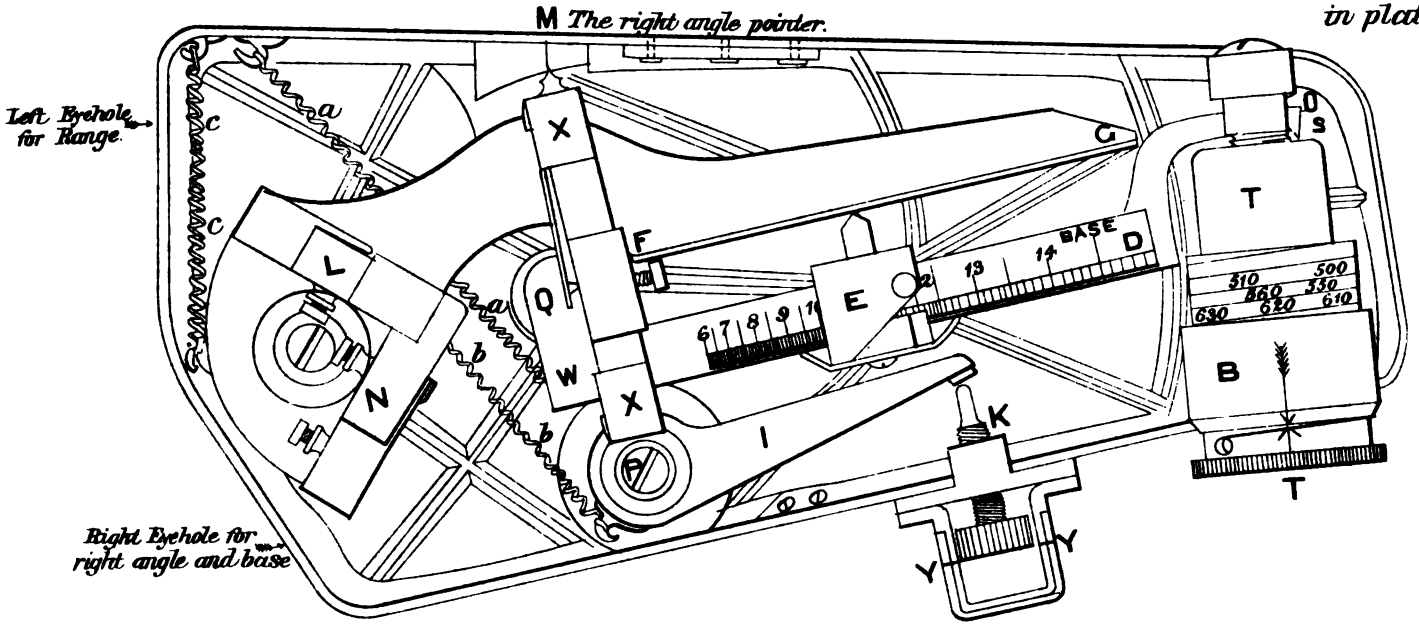
a.a....*Base bar spring.*
b.b.....*Compensating bar springs.*
c.c.....*Steel bar spring.*

Scale about $\frac{3}{4}$ full size.

THE ROBERT PETERS CO. PHOTO-LITHO WASHINGTON D.C.

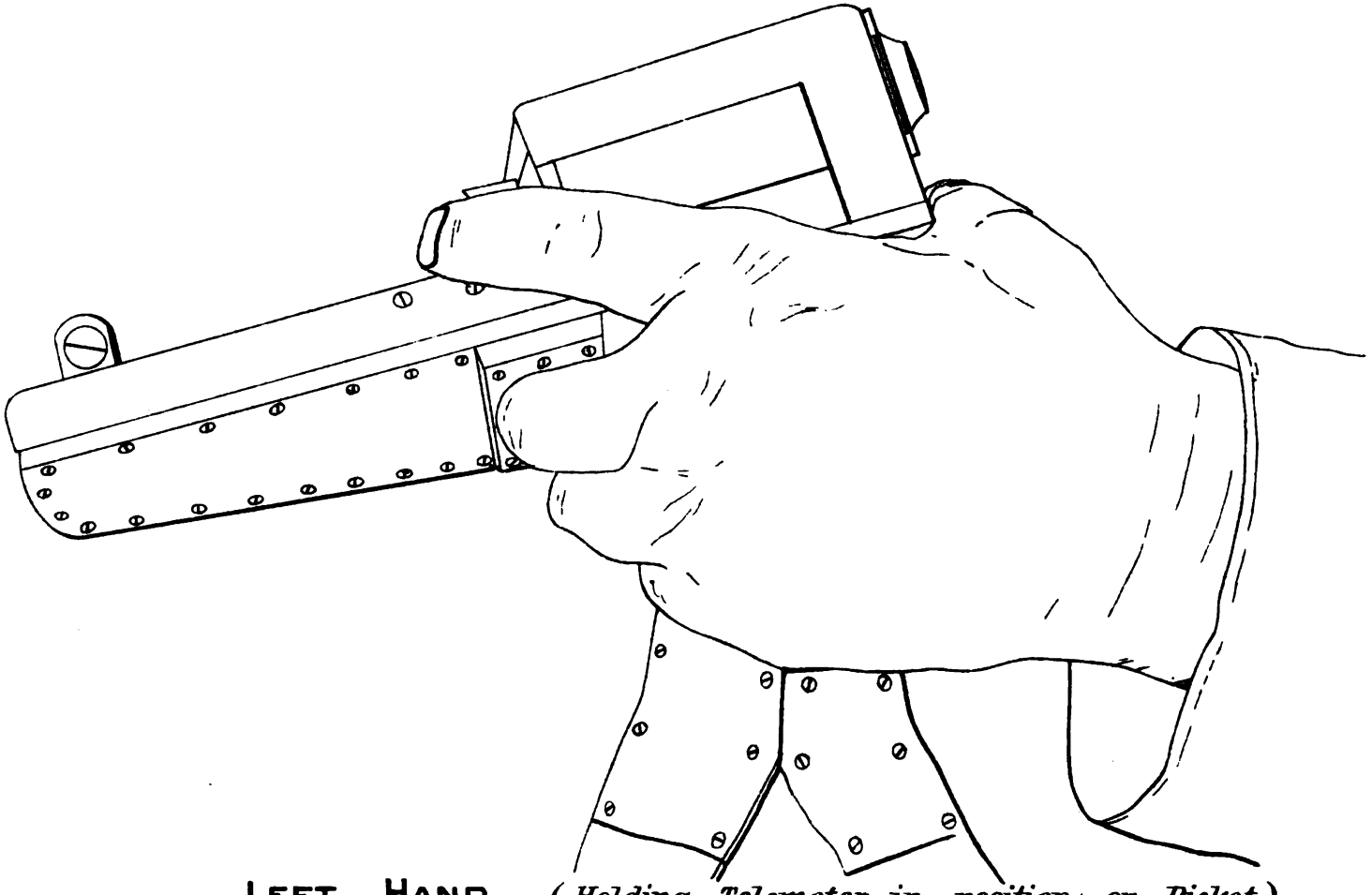
FIELD TELEMETER PLAN. *(Cover removed.)*

References same as in plate III.



Scale about $\frac{3}{8}$ full size.

THE WORRALL PETERS CO. PHOTO LITHO. WASHINGTON, D. C.

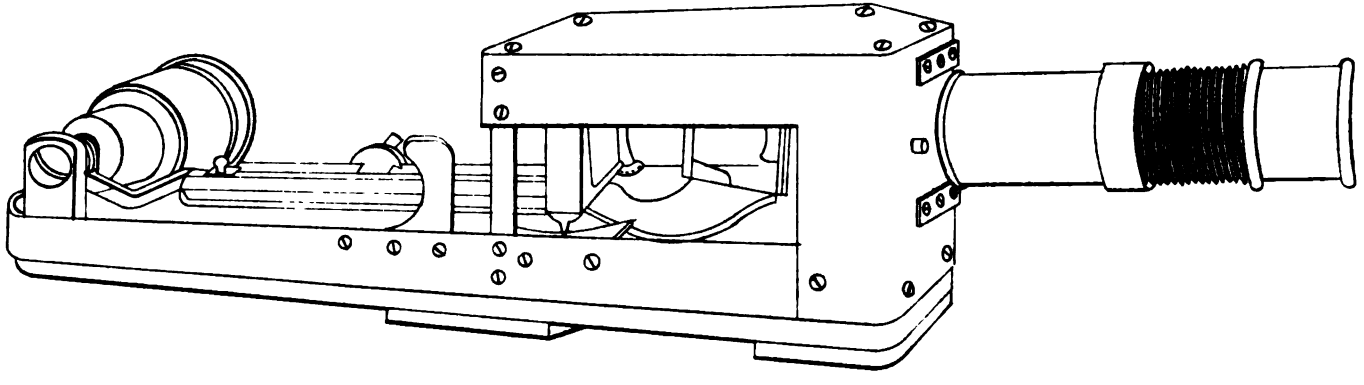


LEFT HAND. *(Holding Telemeter in position on Picket.)*

THE HOBBS PETERS CO. PHOTO-LITHO WASHINGTON, D. C.

FIELD TELEMETER PERSPECTIVE VIEW.

(Cover on;-showing left side – Clip for forefinger of left hand & Telescope.)

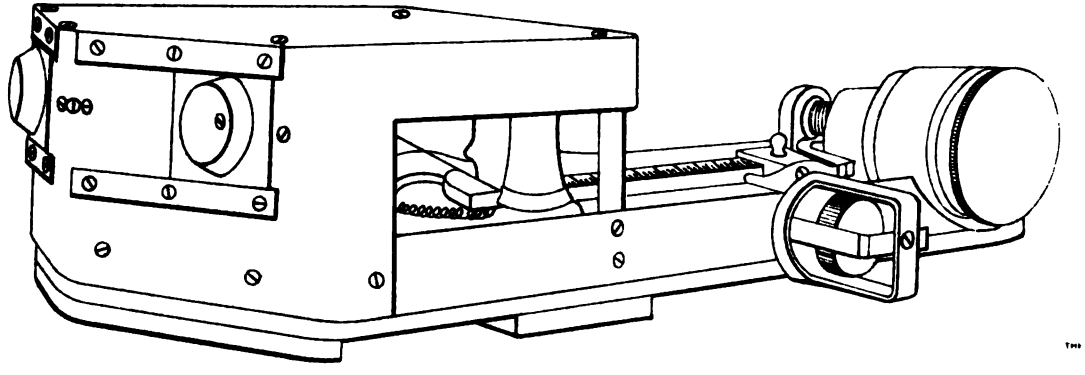


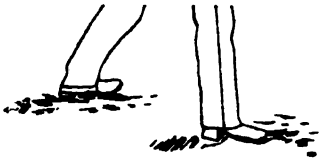
THE RUSSELL PETTIT CO PHOTO-LITHO WASHINGTON D C

Plate VII.

FIELD TELEMETER PERSPECTIVE VIEW.

(Corer on - showing right side - adjusting screw & Eyehole shutters.)

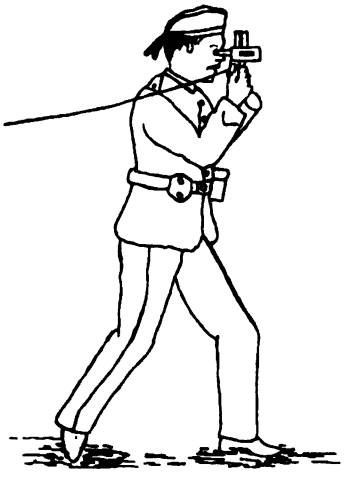




Nº1 OBSERVER.

POSITION II.

(Central.)



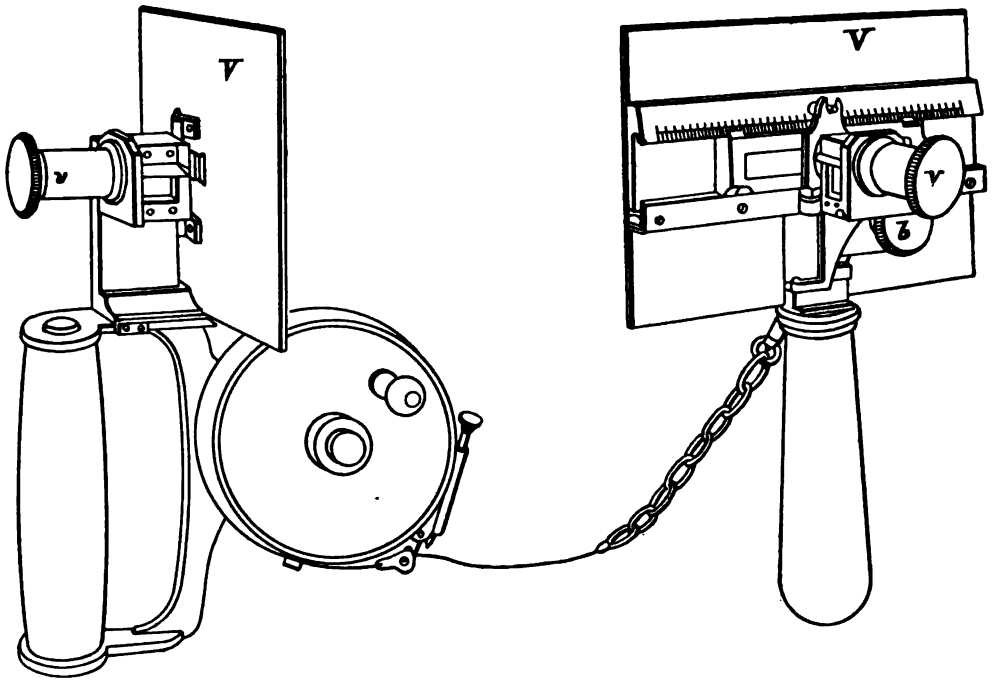
Nº2 OBSERVER.

FRANCE.

FIELD ARTILLERY RANGE FINDERS.

THE GOULIER TELOMETER.

The Goulier telometer (not telemeter) consists of two instruments, A and B (fig. 1), connected by a light wire of aluminium bronze, 40 meters long. Each instrument consists essentially of (*a*) a screen V, having painted on it a black vertical line, which represents at once the axis of the instrument and that of the observer, and provided with a central opening or window; (*b*) a telescope *v*, and (*c*) a pentagonal prism, two faces of which are silvered. The prisms are so arranged (fig. 2) that the observer sees directly to his front the objects on his right, by virtue of double reflection (instrument A), while in the instrument B he sees directly in front of him the objects to his left. Objects directly in front are seen through the telescope over the prism.



Instrument A. *Instrument B*

FIG. 1.

The prism of each instrument is inclosed in a box which is interposed between the telescope and the screen. One angle of the prism is a right angle (fig. 2). The angles opposite the right angles, formed by producing the sides BC and ED in one prism, and the corresponding sides in the other, are equal to 45 degrees. The faces BC and ED are the ones that are silvered, thus forming two converging mirrors.

It may readily be shown that any ray SM incident to the face AE, whether normal or not, will emerge at right angles to its original direction. If the incident ray is normal, it will emerge normal to the other face. In all positions, therefore, the observer will see the image of the signal in a perpendicular direction. Bringing the image to the upper plane of the prism, and at the same time looking over the prism through the telescope, he can make the image of the signal coincide

with any objective in the perpendicular line. The signal is supplied by the reference line on the instrument of the second observer.

The instrument B carries a part peculiar to itself, viz, a refracting prism of variable angle interposed between the pentagonal prism and the screen.

This "compensator" or prism of variable angle is formed by the combination of two zones cut from lenses of the same focal distance or radius of curvature. The smaller lens, which is fixed, is plano-concave; the larger, which is movable, plano-convex. When two such lense are superimposed, their spherical surfaces being in contact, the combination forms a plate of glass with parallel surfaces, incapable of changing the direction of rays transmitted through them (fig. 3). But if one of the lenses be displaced, objects are displaced to the right or left, as the case may be.

When the two lenses of the prism are in the initial position, their optical axes coincide, and rays passing through the prism will not suffer any change of direction. The displacement of the movable lens is made by the milled head *b* (fig. 1) along a graduated slide. The deviations of the ray produced by the displacement of the lens are sensibly proportional to the displacements themselves, or to the distances of which they are the parallaxes.

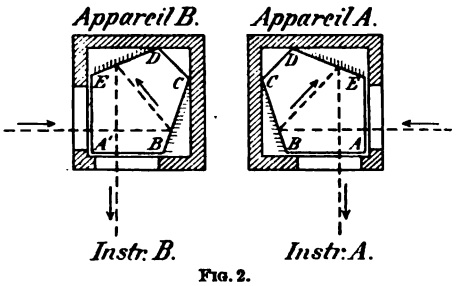
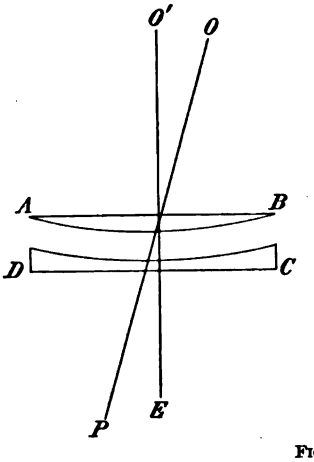


FIG. 2.



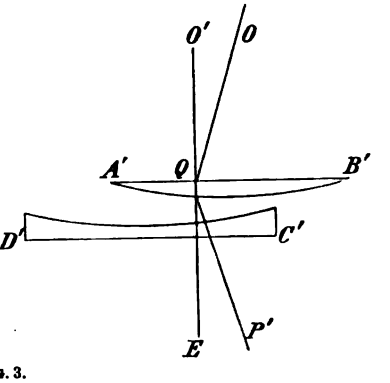


FIG. 3.

The displacement is registered on the instrument B by means of two movable indexes. The right index moves along a scale of distances corresponding to a normal base of 40 meters, the left index moves along a scale which gives the relation $\frac{D}{B}$ of the distance to the base.

Use of the instrument.—To obtain a range, the telometer is used in the following manner: The wire having been unrolled and drawn taut, and the two observers facing each other, observer A stands with the objective C on his right, observer B with the objective on his left (fig. 4). Observer A will move in such a manner that the image of the objective C which he sees by reflection will coincide with the reference line of the screen of instrument B, seen directly. Having gained this coincidence by calling to B to move to the right or left, forward or rear, making, if necessary, slight changes of his own position, observer A will find himself at the vertex of a right angle, one of whose sides has the direction AC, and the other, AB, δ being the angle at the objective C. Before commencing the range taking observer B brings the deviating lens of his instrument to its initial position, when the index will point to zero, and rays incident to the lens will suffer no deviation. Now, if B sights on the reference line of the screen A he will see the image of A in the direction BD, which makes with BC an angle of 90 degrees, and which consequently makes with BA an angle equal to δ.

Now, if the observer B turns the milled head *b* (fig. 1) and displaces the lens along its slide until he sees the image of A in the direction BD, the displacement of the lens will correspond to

a measurement of the angle opposite the known base of the triangle ACB, whence the corresponding altitude AC may be determined, as we have, $AC = \frac{AB}{\tan \delta}$.

In point of fact the lengths of AC for the given base of 40 meters and the several values of the tan δ have been calculated, and the slide of the movable lens has been graduated accordingly.

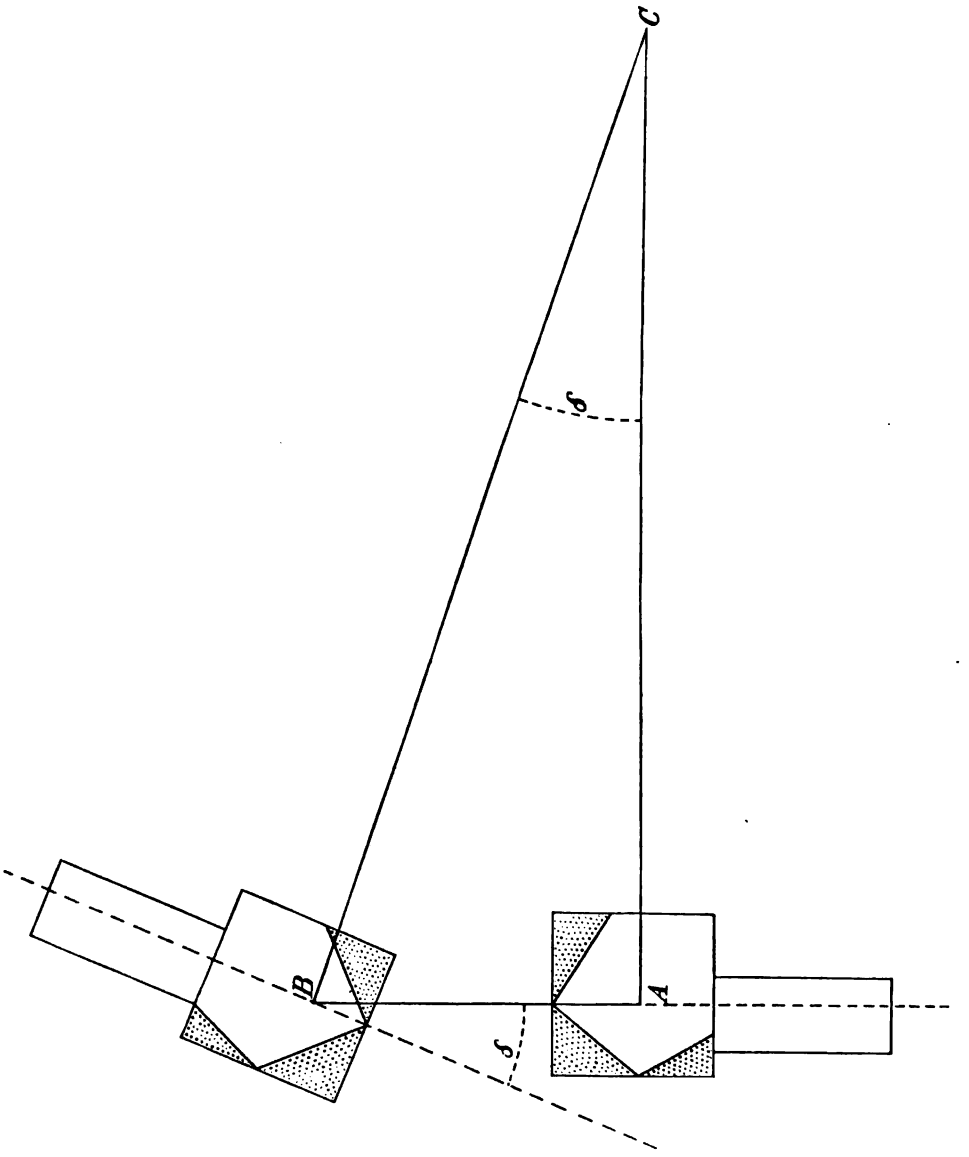


FIG. 4.

The right index, which the lens carries with it in its movement, points to some division of the graduation in distances, which gives the range directly.

By repeating the same operations, say, ten times, and taking the mean, a trained observer may arrive at a very close approximation. If the range desired is small, half the wire, or a base of 20 meters only, may be used. As, however, the distance that will be read on the graduation corresponds to a base of 40 meters, the number found must be divided by 2.

The two instruments are carried in a wooden box, which also contains a few spare parts, etc. This box is slipped into a leather case, provided with straps, and is carried by No. 3 trumpeter slung over the shoulder. For ordinary transportation the telometer is carried on the battery wagon in the instrument chest of the battery.

The Goulier telometer was one of the first really serviceable range finders invented, and was exhibited complete at the Paris Exposition in 1867. Notwithstanding the activity of inventors in this field in recent years, the small real progress that has been made is shown by the retention of the Goulier in the French field artillery to-day.

INFANTRY RANGE FINDERS.

Two range finders have until recently been in use in the French infantry, the Labbez and the Goulier.

The Labbez is a two-mirror instrument, the use of which requires a measured base. It has been discarded for the Goulier, and the latter has been replaced by the Souchier binocular telemeter, a brief description of which will be found below.

The Labbez has been several times described in English and American publications, notably in Ordnance Note No. 170, of 1881, by Lieut. (now Capt.) A. H. Russell, Ordnance Department.

The Goulier infantry telemeter, as far as is known, has not been described in English. It consists essentially of a tube carrying a pentagonal prism serving as an optical square, a system of two lenses forming a prism of variable angle, and a small triangular prism which is intended to be utilized in the measure of the base. A small Gallilean telescope is sometimes added for the purpose of greater accuracy.

The infantry Goulier is a single instrument, the use of which requires the measure of a base line of constant length—20 meters. Its principle is very similar to that of instrument B of the Goulier telometer used in the French field artillery, already described.

The minister of war decided, under date of the 1st of May, 1894, that as fast as the Labbez and Goulier telemeters are turned in they will be replaced by the "jumelles-télémètres" of Captain Souchier, at the rate of one for each battalion.

A later order from the minister of war notified the several corps not to wait until their old telemeters were unserviceable, but to purchase the new Souchier from the proper "masse" as soon as possible. Accordingly it is believed that every infantry battalion of the French army has in its possession to-day one of these instruments.

The Souchier binocular telemeter has also been adopted in the French infantry de marine.

The details of the construction of this instrument have not been given out for publication by the French Government, but brief unofficial descriptions of it have appeared, the most important of which is by Captain Danritt, of the French army (translated in the Journal of the Military Service Institution, July, 1895, p. 144). There is another in the Scientific American of the 9th of February, 1895, where the instrument is miscalled the "Souchard."

As described by Captain Danritt, its essential features are as follows:

The Souchier "jumelles-télémètre" is a powerful binocular telescope. When properly focused there are interposed between the eye and the objective, by the simple pressure of the finger, two prisms of certain refracting properties. Immediately there is no longer one image of the objective, but a double image, or two images, appears. One of these is the real object, the other is an image virtually created by the prism, but easily recognizable by its shaded appearance, by the fact that it appears to be behind and relatively higher than the real image, and also by the fact that as the distance increases the false image rises proportionally in rear of the real one. All the value of the telemeter lies in this last fact. The object which serves as a base for this instrument is a man standing or on horseback.

If the head of the real image is at the height of the shoulders of the false one the distance from the observer is 300 meters; if at the waist, 600 meters; if at the knees, 1,000 meters. If the false image is above the real, so that its feet appear to rest on the head of the real one, then the distance is exactly 1,400 meters. If the two images separate, then the distance is over 1,400 meters, and the values are no longer proportional or constant.

Great results already appear from having the power, without measuring a base and without moving forward or backward, as in the Labbez and the Goulier, to estimate correctly a distance within the limits of really effective range.

The Scientific American states that the prisms on which the properties of the telemeter depend are of Iceland spar, the double refracting properties of which are well known.

GERMANY.

Field range finders are not employed in the German army. In the infantry officers and men are trained to estimate accurately distances by the eye, and where the nature of the ground permits the estimated distance or range may be corrected by firing successive volleys on the bracket system. Lüttig's telemeter, which is intended to be used in the instruction of troops in estimating distances, has recently been supplied to a number of regiments by Springer, of Berlin. Though it would not be impossible to use this instrument for obtaining ranges directly, in the field, it does not appear that it is ever to be used for such a purpose. It consists of a powerful telescope with cross wires, with a stadia rod, and is mounted on a light tripod. The error is stated to be about 10 and 25 meters at 300 and 1,600 meters, respectively. In the field artillery the estimation of the distance of the target is left to the battery commander, and the estimated distance is corrected by trial shots on the bracket system.

ITALY.

FIELD ARTILLERY RANGE FINDERS.

1. FIELD TELEMETER (GAUTIER'S).

The determination of the distance (fig. 1) of the observer A from the target B is reduced by the telemeter to the solution of a right-angled triangle, in which the base b is obtained by actual measurement and the angle B is given by the instrument.

We then have

$$c=b\frac{1}{\sin B}=b \operatorname{cosec} B$$

For convenience in calculation, the instrument, instead of showing the value of the angle B, gives directly the reciprocal of its sine, i. e., the cosecant, by which it is merely necessary to multiply the length of the base b in order to obtain the distance c from the target.

The same formula is also applicable, without serious error, when the angle C is not an exact right angle, provided it does not deviate therefrom by more than 8 degrees.

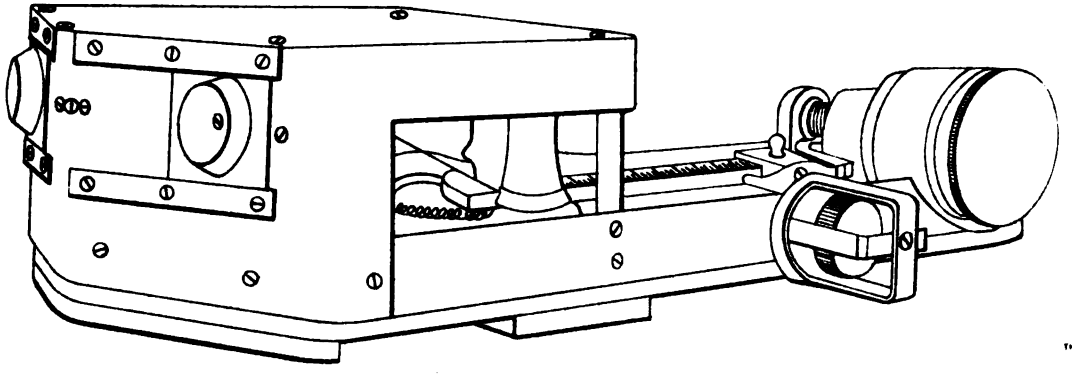
The field telemeter (fig. 2) consists of a brass tube or barrel, the principal parts of which are a prismatic object glass and two small mirrors; in its rear end is a focusing eyepiece through which the observer can see simultaneously both the objects that lie to his right (or left, as the case may be) and directly in front of him—the former by double reflection in the mirrors, the latter by refraction through the prismatic object glass. This is set in a hoop or ring which turns about the barrel.

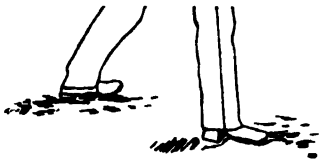
In its initial position the outer face of the prismatic object glass will be perpendicular to the vertical plane of sight. In this plane any ray which is approximately horizontal and which is incident to the face of the prism will suffer some vertical displacement (which is of no consequence), but no lateral deviation. When, however, the hoop containing the object glass is revolved the image of the object from which the ray proceeds will be displaced both laterally and vertically,

Plate VII.

FIELD TELEMETER PERSPECTIVE VIEW.

(Corer on - showing right side - adjusting screw & Eyehole shutters.)

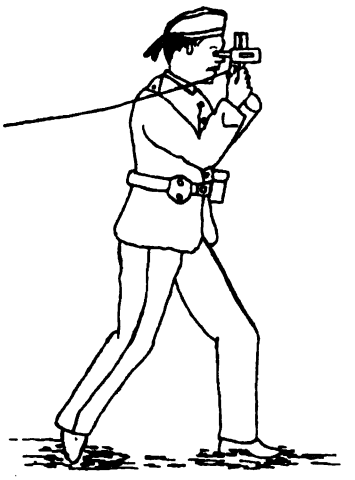




No. 1 OBSERVER.

POSITION II.

(Central.)



No. 2 OBSERVER.

KM equal to $135 \times 2 = 270°$, and the angle at O, between these two lines produced, is therefore a right angle. In the quadrilateral AMOQ we have the opposite angles at A and O both right angles; the sum of the other two angles AQO and AMO will therefore be equal to two right angles. We have also OMB + AMO = two right angles. Equating these and taking away the common angle AMO, we have AQO = OMB. Hence the ray TQ is incident to the face AC at the same angle at which KM left the face AB. By the laws of optics, then, the angle R′QL′, which the incident and emergent rays make with each other at Q, will be equal to the angle SMM′, which the incident and refracted rays make with each other at M.

The triangles OLM and QRL have the angle at L in common; the angles OML and RQL are equal, since their opposite angles are equal to each other. Hence the third angles of the two triangles must be equal, or QRL = MOL; the latter angle being a right angle the first must also be a right angle. Therefore the ray R′Q, after two refractions and two reflections, emerges perpendicular to its original direction.

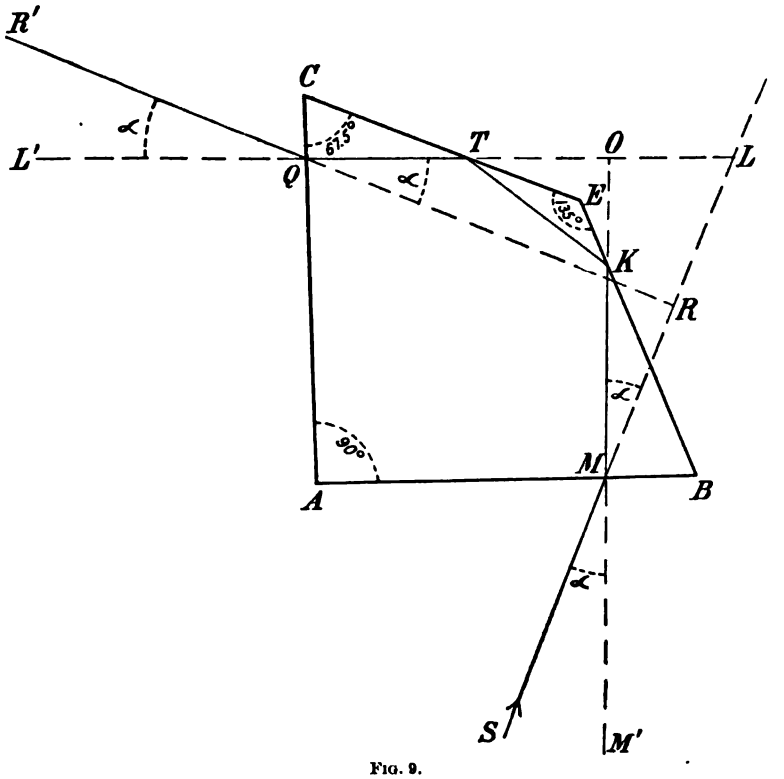


FIG. 9.

Applications.—In using this prism to lay off a right angle, one of the sides bounding the right dihedral angle must be held toward the eye, the observer sighting at the signal B (fig. 3) over the prism and through the window next his eye and the window in the opposite side of the casing. The other face bounding the right angle is turned with its window toward that part of the ground on which it is desired to lay off the perpendicular, or toward C. The ray from C, entering the prism by this window, will emerge from the window toward the eye, so that C will appear to coincide with B.

The applications of this prism are then entirely similar to those of the one first described.

INFANTRY RANGE FINDERS.

The only range finder that is known to be used by the Italian infantry is the "Pavese," of which no official description has yet been received. It is known to be a very small instrument, not larger than a pocket watch, and not costing more than 25 francs or less than $5. Its average error, in the hands of a trained observer, is stated to be not more than 4 or 5 per cent. From statements that have appeared in various foreign military journals, it would appear to be some kind of reflecting instrument, and that it requires no base and no tables. It is stated that the manufacturers are the firm of "Salmoiragki," in Milan.

RUSSIA.—THE INFANTRY TELEMETER.

THE SOUCHIER TELEMETER.

This instrument consists of a pentagonal prism ABCDE, inclosed in a casing which leaves two openings, AF on the face AB, and another DG. The latter is provided with a sliding shutter which when pushed over to G will leave the face CD exposed for use, and when pushed over to D will leave the portion CG of the face BC exposed for use. The angles of the instrument are A, 67° 30′; B, 90°; C, 177° 50′; D, 69° 40′; E, 135°.

Looking through CG the rays from an object O, after undergoing double reflection by the faces AE and DE, will strike CG normal and the image of O will appear at O′ in a direction at right angles to the original direction of its rays.

Looking through CD the rays from the same object O, after undergoing double reflection as in the previous case, will in addition suffer refraction by the face CD (the angle at C being 177° 50′) and the image of O will appear at O″, and the angle between the two lines of sight to O′ and O″ will be 1° 10′ (from the construction of the instrument).

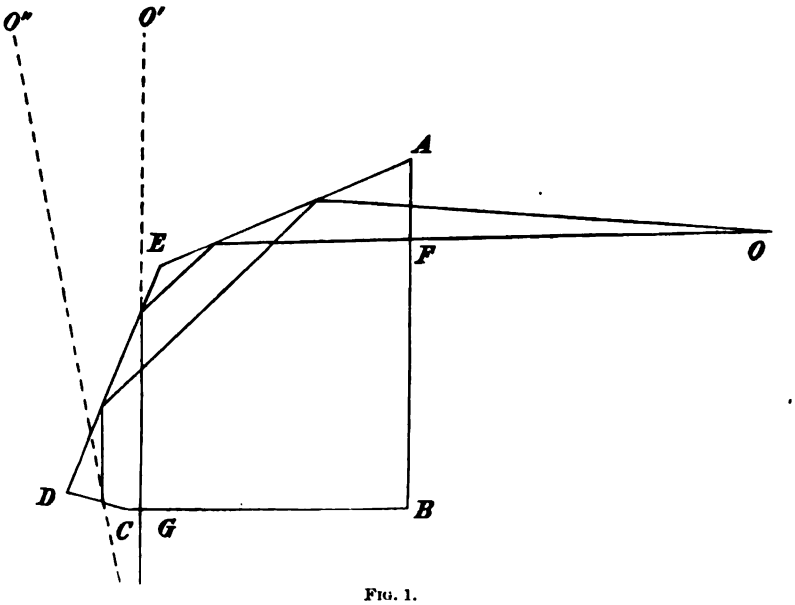


FIG. 1.

Application (*fig. 2*).—Desired the distance AO. Stand at A, look through CD, locate image of O, look through CG and move backward until the new image of O coincides with the previous one. Measure the distance stepped off. The result is 1:50 of the distance (the sine of 1° 10′ is almost 1:50).

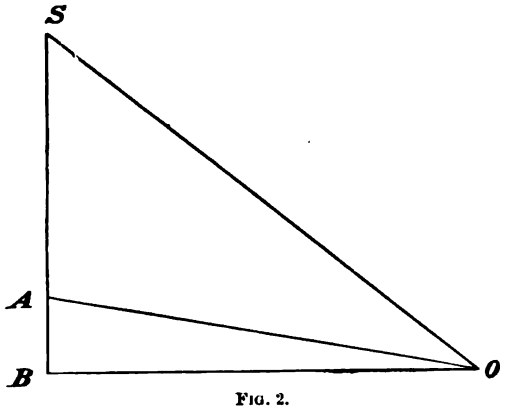


FIG. 2.

Use of the instrument by moving away—to the rear—from the signal (*fig. 2*).—Slide the shutter over letter A[1] so as to expose the window over R, hold the instrument in the left hand, point of thumb on the face which carries the distance table, the next three fingers on the other parallel face, which is up. Stand so as to have the object to which the distance is sought on your right, hold the instrument as near horizontal as possible in front of your eye, the fingers of the left hand so curved that you can observe the foreground through the space below your fingers and above the upper parallel side of the instrument. Look through the instrument until you obtain an achro-

[1] The letters A and R are engraved on lower face of instrument (that on which the table of distances also is), the window over R corresponding to CD in figure 1, and the window over A to CG in same figure.

matic image of the object O. If the latter is not in sight at first, turn slowly to the right or left, without deranging the relative position of the instrument and your eye, until the object comes in view. Fix the direction of the object on the ground in front by looking through between your fingers and the top of the instrument and noting with what plainly visible object in the foreground it coincides. If it does not coincide with any clearly defined object, move away to the right or left until you can fix such a coincidence at some point S. Mark the point where you are standing by some object and call it station A. Now push the sliding shutter over R, exposing the window over A, look through and move backward on the prolongation of a line SA until you reach a point B, at which the image of O is again seen to coincide with S. Measure the distance AB, find the number of units in column B of table on lower face of instrument, and the figure opposite in the adjoining column D will be distance AC. Approximately, you would only have to multiply the distance AB by 50 to obtain the distance sought, but each instrument has its own table adjusted accurately for each distance in meters, on account of difficulty of getting the angle at C with perfect accuracy in the construction of the instrument.

To measure the distance by advancing toward the signal S instead of moving away from it, as in the method just described, proceed as there described except that you first push the shutter over letter R and look through window over A to locate signal S. Then push shutter over A and look through window over R, advance toward S until the image of O and the signal S again coincide. Then measure as heretofore.

The distance may also be measured by holding the instrument in the right hand. Stand so as to have the object O on your left, hold instrument in your right hand in a position analogous to that described for the left hand, the side carrying the scale being uppermost, then proceed as heretofore laid down.

The method of moving away from S facilitates accuracy, that of moving toward S rapidity; the latter should be employed only if the signal S is more than 500 meters distant.

The table on the lower parallel side of the instrument gives the distance from 500 to 3,100 meters (546.8 to 3,390 yards).

Translation of the Regulations for the Treatment, Training, and Employment of War Dogs by the Rifle Battalions of the German Army.

INTRODUCTION.

1. The extraordinary qualities of the dog, his docility and watchfulness, the acuteness of certain of his senses, his affection for man, and his speed render him adaptable for military purposes.

The dog is particularly useful in the service of security and information, in carrying reports from advanced patrols, in assisting outposts, in maintaining communication between posts and pickets as well as between other parts of the outposts, and lastly, to a limited degree, in hunting up missing men.

I.—Breed, Requirements of Trained War Dogs, Training.

A.—Breed.

2. Bird dogs, poodles, and shepherd dogs are suitable for training for military purposes. In making selection, the breed of the dog is less important than the purity of the breed and the qualities requisite for the war dog.

3. These qualities are: Perfect health, robust body, particularly broad chest and sinewy legs, acute ear and nose, docility, endurance, and watchfulness.

4. Poodles are particularly esteemed on account of their docility, and they may therefore be employed for use for the purpose of instructing young trainers in the methods of training dogs. When old, however, they frequently lack interest in their work, and will often be found wanting in the accomplishment of the more severe tasks.

The shepherd dog has in common with the poodle a high degree of intelligence; his ability of withstanding climatic influences, his watchfulness and attention to the orders of his master, would render him particularly suitable for use as a war dog were it not for the fact that in many cases his training is rendered difficult by his character, which is lacking in affection.

The bird dog unites the good qualities of the foregoing two breeds and is distinguished by a lively sense of duty and attachment. His inclination for hunting is lost more and more as he becomes conscious that other things are required of him.

5. Battalions which do not receive dogs from the military kennel may themselves select the breed. If they breed the dogs themselves, which is to be recommended, they should lay stress on a proper crossing of breeds.

B.—Requirements of a Trained War Dog.

6. It is required of a trained war dog that he has passed through a general preparatory course of training and brought up to obedience to call and signal; that he carry messages with certainty—that is, that he run back from the advanced patrol to detachments in the rear and then return to the former—and maintain communication between stationary detachments and sentinels; that

he be watchful and bring to notice of sentinels the approach of strangers. These points form the guiding principles in the training.

7. As a general rule they need not be trained for hunting up missing men.

If some dogs show special aptitude therefor, and if their trainers have sufficient skill to educate them up to it, the hunting up of missing men may be included in the training.

C.—The Training.

GENERAL.

8. In general it may be stated that in the training of dogs two methods are used: The severe training, by use of forcible means, of the dog kept isolated, in order to bring about an unconditional subordination of the will of the dog to that of his master, and the mild method of training, in which stress is laid on the intercourse of the dog with his master and on the development of the dog's intelligence.

9. The selection of the method of training will depend upon the individuality of the dog, but the last-named method is preferable. It forms the base of the following details of the course of training:

THE TRAINERS.

10. The entire training of the dogs of a battalion should, as a rule, be placed in the hands of an officer (lieutenant) familiar with and experienced in these matters. Under him are to be placed the personnel of trainers, the conductors of the dogs, and their assistants selected from corporals or privates.

11. If there is a suitable officer in each company, the dogs may be trained by companies under the direction of these officers.

In the absence of suitable officers vice first sergeants may instead be employed. This matter is regulated by the battalion commander.

12. As conductors or trainers of dogs, corporals, lance corporals, or privates should be selected of quiet but determined character, who may appear suitable for this employment by their education and conduct. It is not requisite that they should have worked dogs before; but it is essential that they take interest and show zeal to learn, and that their conditions of service be such that they will remain with the company for some time to come. On the latter account privates of class A should in the first line be selected for this branch of the service.

13. In the further course assistants are to be given to the conductors, and in their selection regard should be had to the foregoing principles, as they are to take the places of the conductors when discharged.

Frequent changes of conductors and assistants are to be avoided as much as possible.

14. If the war dogs of battalions are intrusted to one officer, he will select the trainers after consultation with the company commanders. If they can not agree, the battalion commander will decide, having due regard to the other interests of the service.

THE SUPERINTENDING OFFICER.

15. The superintendent is charged with the procurement of the dogs; with the distribution of the dogs among the companies; with the supervision of the rearing of young dogs; with the supervision of the feeding and care of the dogs.

He is to prepare, by continuous instruction, the trainers for their work, and to superintend and advise them during the training.

16. The following remarks are to be considered as suggestions in this particular:

The instruction of the training personnel by the superintendent extends to information of the purpose to be accomplished, to instruction in keeping a diary (see Appendix 2) and to the inspection of the same, to the method of training and the course of training, which is to be progressive,

corresponding to the capabilities and intellect of the dog. In case of irregularities in the course of training, it becomes the duty of the superintendent to examine into the causes and remedy what errors may have been made.

It is the duty of the superintendent to judge whether the conductor possesses the qualities which he was presumed to possess. It should be his endeavor to encourage the conductors by example and advice if their activity and interest in the work should slack, and to spur them in a suitable way to indefatigable perseverance.

THE COURSE OF TRAINING.

17. The training is to extend to (1) guiding by the line (thong), (2) development of watchfulness, and (3) to going and returning.

PREPARATORY REMARKS.

18. In order to be more easily understood by the dog, the course of any portion of the instruction, of any exercise, is divided into preparatory parts or stages.

The further the work progresses the greater is the development of the dog's intelligence and the easier becomes the training. It is important, therefore, to pass gradually from the simple to the difficult and never to demand more of the dog than is intelligible to him. When the dog once comprehends what is expected of him, the next question is to fix what he has learned by constant practice before passing to another subject. The amount of time required will depend upon the importance and difficulty of the exercises.

The superficial learning of an exercise will frequently lead to misunderstandings on the part of the dog which are hard to eradicate.

The following principles should, therefore, be observed:

The conductor should endeavor with calmness and perseverance to make intelligible to the dog what he is expected to do, and take care that what has been learned becomes firmly fixed. Thus, any branch of the training is divided into the instruction, fixing of what has been learned, and complete training.

19. The fewer punishments that are meted out the better it speaks for trainer and dog. Punishment may be administered only after the dog has comprehended what he is expected to do, and when, therefore, it is disobedience alone that is to be punished.

The trainer must be sure, before punishing, whether it is a case of disobedience which may be punished by scolding or beating with a stick. The use of spiked collars is forbidden.

Rewards should also be meted out sparingly. It is not advisable to habitually give the dog tidbits, since they serve more to divert the dog's attention than to benefit him; in most cases friendly words are sufficient reward.

20. As regards the age of the dog at which to begin the training, the latter may be begun early with those dogs which have been reared by the battalion—that is, they may be made accustomed to the trainer, and bad habits may be corrected.

Bringing up, training, and education should go hand in hand, but the education proper should not be begun before the dog is at least six months old.

LEADING WITH THE LEASH (STRAP).

21. The exercises consist in this, that a dog who is fastened to the leash (strap) (see No. 64) be walking on the left side of the conductor without the latter having to hold the line taut in his hand. It is immaterial whether the dog walks a little in the rear or in front of his master as long as he does not pull and the line is hanging loose between the two.

22. Instruction in this exercise is begun in the early age of the dog in this manner, that the dog is not allowed to leave the barracks except fastened to the leash. The young animal will at

first probably make difficulty and want to run forward or stand fast. A pull on the line, talking to him, and petting will soon make the dog guess what is expected. If, after going out several times, he should attempt to stretch the line and pull, the instructor should prevent his running forward by means of a thin switch. The dog must comprehend that when fastened to the leash he is to pay attention to his master only, and to nothing else.

23. The ordinary service affords sufficient opportunity to practice leading with the leash, preparatory exercises indoors or in the barrack square not being necessary.

DEVELOPMENT OF WATCHFULNESS.

24. Watchfulness is inborn in the dog and needs but to be developed.

It is required of the war dog that when with his master, in quarters or bivouac, he signify the approach of strangers; that when attached to a sentinel he direct the latter's attention to the approach of strangers; that when tied up he do not allow any strange persons to approach.

These services of the dog will be useful only at night or in cut-up ground. They are manifested by the dog giving notice by growling.

25. The development of watchfulness begins indoors. The trainer is with a dog in a room the surroundings of which are as quiet as possible, and has his assistant knock at the door. He then calls the dog's attention to the noise and incites him to growl by "lookout" and such similar means, the growling probably passing into a bark. If the dog does bark he is not at first to be prevented, in order not to make him timid.

26. The next stage should not be attempted until the dog is larger and stronger and has gained in self-confidence and courage.

At night, at which time the dog's hearing is more acute and his alertness greater than in daytime, the trainer with the dog leashed takes post at some isolated point. After some little time an assistant steals up to them from the windward side, and not too quietly at first. If the dog does not bark of his own accord, his conductor incites him to do so.

Care should be taken that the dog does not attack the man, in order to prevent him from getting into that habit. Such fierce biting dogs are unsuitable for military service. It is essential that at this part of the instruction, at least in the beginning, none act as the assistant whom the dog knows.

27. After the dog has become reliable in giving notice, he is taught to give such notice by growling, it being kept in view that a trained dog gives notice by growling alone. This is accomplished by exercises similar to the foregoing; when the dog is about to pass from growling to barking, which always precedes the former, he is hushed by speaking to him quietly, and if he pays no attention to that, by a light stroke of a thin switch.

28. The exercises should chiefly be held after dark, and particularly during autumn maneuvers where favorable opportunities and suitable assistants are not lacking.

GOING AND RETURNING.

29. Under "going and returning" the following actions of the dog are to be understood: Led away from his conductor by an assistant, the dog, when sent back, returns to the former and again to the assistant. The trainer and the dog leave the assistant, the dog is sent back to the latter, and from the latter the dog returns to his trainer.

The dog is to do that frequently, and up to distances of 4 kilometers, the points between which he is coming and going as well as the road by which he is traveling being known to the dog.

When sent back by the assistant to the trainer over greater distances, the dog himself selects the shortest route.

30. The intermediate stages of this part of the training are retrieving, running back and retrieving lost articles, running forward and retrieving an article carried out by the assistant,

dispensing with the article retrieved, and, instead, use of the pouch,[1] and extension of these exercises over great distances.

31. Only very light articles, such as gloves and knotted handkerchiefs, should be used in retrieving. The trainer uses such moments in which the dog shows inclination for this kind of work; he throws down the article and has the dog bring it. It is not advisable to compel the dog to sit down in order to take from him in this posture the article retrieved. If the dog is made to sit down in the beginning he frequently does not know whether he was right in retrieving, and drops the article retrieved. If the latter is taken from the dog's mouth as soon as he approaches, and if the dog is then petted, he will know exactly that he did what he was expected to do.

It is well to make the first experiment in retrieving indoors, in order that the young animal being in a playful mood may not run off.

32. In the second stage, which should not be attempted until the dog is sure and willing to bring the article to the teacher a distance of some paces, the dog is leashed, the article is then thrown, and the dog is then released to retrieve.

Having learned this the dog is taken out into the country by the trainer, who drops something so that the dog can see it, walks on a few steps, and then calls upon the dog to retrieve it.

As soon as the dog sees the thrown article drop, he will want to pick it up, but no attention is paid to him and the walk is continued a few paces.

Afterwards the article is dropped unnoticed by the dog and after passing on a few paces the dog is invited to run back and retrieve it by pointing to the ground and driving him on with "forward" and similar words. If he does not run back, the trainer walks to the rear with him until he sees and retrieves the article thrown.

33. Too frequent repetition, too great exertions should be avoided. The trainer must be able to judge whether the dog runs cheerfully or feels bothered or vexed, in order to suspend the exercise in proper time. Narrow, unfrequented roads are best suited for exercise grounds. The article to be retrieved must be known to the dog and be lying openly in the road, it being required in the first place that the dog run back, pick up the article, and return.

34. As training progresses, the trainer uses an assistant. The latter holding the article to be retrieved open in his hand walks away from the conductor. Shortly afterwards the conductor sends the dog after the assistant with the call "forward" or other words that he may have selected. The dog will then take the article from the hand of the assistant, the latter keeping himself entirely passive, and return with it to his master.

At this stage it will be possible to leash the dog after each performance without perplexing him.

35. The exercises are continued in such a manner that trainer and dog remain standing and the assistant advances, or the latter remains standing and the former advances, until it is immaterial to the dog whether he run forward or back in order to fetch the article to be retrieved from the place known.

36. A further step in the course of training is made in this way, that the initial and terminal points of the distance to be traversed are so selected as to be invisible one from the other. The progress must be gradual; the point is to confirm the dog in these exercises, and spend the proper amount of time and labor on him. One hundred and fifty to three hundred paces will probably be found distances suitable for the strength of the young animal.

37. After the training has progressed to this extent it is not infrequently the case that the dog appears as though the previous training had made no impression whatever upon him. Patience and judgment will then all the more be required on the part of the trainer. Such action on the part of the dog is brought about less by the fact that he did not understand, than that he has become tired of carrying out these exercises. The trainer will have to reflect whether he did not

[1] The pouch which is carried by a trained dog when on duty.

proceed too rapidly, whether he did not require work of the dog after the latter was fatigued, whether he did not perplex the dog by his own actions. The latter frequently results in the dog halting after running a short distance from his master. As a remedy therefor it is recommended to the trainer on his part to walk away in the opposite direction, which in most cases will prompt the dog to quickly carry out his task in order to rejoin his master.

38. A further step in this course of training consists in the master sending the dog to the assistant and the dog being held by the latter for a short time. In these exercises the assistant adroitly and quietly leashes the dog and lets him run back to his master only after some minutes with the corresponding command. Particular stress should be laid on handling the dog correctly and adroitly on his arrival, and in leashing him. Taking hold of him awkwardly so as to give him pain will sometimes spoil him for a considerable time; dispensation of tidbits will often serve to make him more confident.

39. The use of the report pouch (see No. 63) may now be proceeded with. The latter is shown to the dog and then fastened to him. At first it is well to give the dog some article in his mouth to fetch; after a few repetitions this may be dispensed with, and the dog will be trained in the simplest form of carrying messages, which, however, do not yet fit him for service of this character.

It is advisable in using the report pouch always to put a piece of paper in the pouch before the dog's departure and take it out upon his arrival in such a manner that the dog will see it. The paper, the slip, is used later on for checking the time of departure and arrival.

40. The distances are increased corresponding with the strength of the dog, and the work is continued in such a way that the dog passes from his master to the assistant or the reverse by a road known to him. In view of the fact that but little influence can be exercised on the speed of the dog, care should be taken to preserve his pleasure in the work. The dog should not, therefore, be overworked or bored, and the distance to be traversed should be increased very gradually.

At this stage of the training the dog may be used in the service of the company provided he has thoroughly learned what is required of him.

41. It now remains to practice traversing greater distances by the shortest route. The work should be done over ground where the view is obstructed. The assistant leading the dog by the leash walks away from the conductor moving in various directions and sends the dog back to his master with the proper command. After some attempts to follow the scent, the dog will select the shortest route on his own accord. There are no means of making him understand how to take crosscuts. The distances are gradually increased to 4 or 5 kilometers.

42. The dog should also be habituated to overcoming obstacles of terrain and not avoiding water courses of some width.

For the latter it is required that the dog know how to swim. That he is taught, independently of his other training in bathing and swimming. If the dog takes kindly to the water, the assistant with the dog goes to one bank, the conductor to the other, in order to teach the dog how to cross water courses on service. The conductor calls the dog, and the assistant sends him into the water.

43. When the dog has gained self-confidence and becomes thorough in his previous work, the exercises are held in frequented places, in villages, and in the dark. The dog becomes easily accustomed to firing without the use of special means, since, as soon as he is permitted to leave the barracks, he is taken along to the target range, and his first service may consist in maintaining communication between the firing stand and the markers.

44. The final test of his training consists in the dog performing his work in the same reliable manner when led by someone else but his instructor. The use of an assistant has served to make it clear to the dog that he is not to obey his master alone. If the previous trainer is replaced by someone else, the former will have to acquaint the latter with the character of the dog, his method

of working, and above all with the system and methods followed by the trainer, so that he may be able to train the dog in exactly the same way. If, under such circumstances, the work of the dog remains reliable, he may be considered trained for employment on service.

HUNTING FOR MISSING MEN.

45. The work consists in having the dog search a piece of brush, part of a wood, a piece of ground with obstructed view, or any piece of ground at night; and as soon as he has found a man, in remaining with him and barking until his master comes up.

46. The course of training is divided into the following steps: Barking by command; retrieving; seeking a lost article and retrieving it; learning how to bark before articles too heavy to retrieve when called to retrieve them; combination of both kinds of work; and barking before men lying on the ground.

These are intermediate exercises, which should partly go hand in hand—partly succeed each other.

47. The first question is to teach the dog when to bark. The best time is the early age of the dog, as when older it is more difficult to cause dogs not already broken to it to bark continuously.

It is to be kept in mind what causes prompt the young animal to bark, and these causes should be taken notice of. Taking advantage of favorable opportunities, the trainers bring about some cause for barking, and subsequently accompany the cause with a command, "bark," or other commands. Training in retrieving is extended to the fetching of heavy articles, side arm with belt, etc.

If these experiments are made with the dog while young, further training in hunting up missing men is not resumed until the dog is perfectly reliable in carrying messages.

48. Next follows searching for missing articles.

This exercise should be held at first on open ground or open woodland. Light articles—handkerchiefs, gloves, an old cap—are placed by the assistant at a point which is approximately designated so that their scent will be diffused to some distance, to enable the dog to discover them by his nose. If heretofore the dog was made to rely less on the use of his nose, any good result of the work now required of him depends on his sense of smell. It would, therefore, be useless to work in this branch of the service any dog that has not a fine nose.

The trainer accompanies the dog in searching against the wind with the command "seek," and himself walks to and fro as though searching. This action of the master prompts the dog to imitate him and incites him to range, while heretofore he was used only to run in one direction.

The experiment must be repeated until the dog searches on his own account.

When the dog has understood and searches by himself, the trainer no longer walks to and fro, and gradually transfers the exercise into less open ground.

49. The dog must also be taught to bark before things which he can not carry. The following method may be employed: As a preparatory exercise, the trainer has taught the dog to bring him his side arm before leaving the room. The side arm is now fastened, and the dog, after the preparations have been made for going out as usual, is called upon to fetch it. He will attempt it, but in vain; the trainer urges him to fetch it, and then to bark. This done, the trainer lets the dog bark all he wants, and then takes the side arm himself and leaves the room as usual.

Exercises of this kind are now transferred from the room to the open, the barrack square, or other suitable grounds.

50. The next step is to practice the searching for lost articles, accompanied by retrieving and barking, both alternating, in the terrain, and subsequently the last stage, the searching for and barking before men, may be proceeded with.

A man hides himself and is searched for in the usual way by the conductor with the dog. The dog will probably easily find the man and endeavor to take from him some article of clothing,

perhaps the cap, and bring it to his master. If he does so, he is made much of, and called upon to search again. He will run back to the concealed man to take some other article from him. If he is unsuccessful in the latter, he will bark. If he does not bark, he is commanded to bark.

51. It will now be necessary to make the dog understand that searching for the man alone is required of him. For this purpose a man is concealed on some considerable piece of ground, and at the same time heavy pieces of equipment (packed knapsacks) which the dog can not drag are hidden away. If the dog barks, the trainer hastens toward him in the usual way; when he has found the man, he is made much of and leashed.

If he barks before something else, he is likewise made much of, but no attention is paid to the article found, and the dog is at once called upon to make further search.

The exercises are next continued on ground with obstructed view and in the darkness.[1]

52. As the work proceeds, the man to be searched for should conceal himself without the conductor knowing the place. The latter will then frequently discover that just when he believes the dog to be on the wrong trail the dog will find the man.

SMALLER TASKS.

53. In connection with the branches of training which have been discussed here and which qualify the dog for use in the service with troops, he may be taught a few less important things which serve as training to the dog and as instruction for the conductor in training, as well as making the dog a pleasant companion.

Among these may be mentioned to sit down, to lie down and remain there, and some other tricks.

54. *To sit down.*—The execution is simple; the dog is required to sit down at the command "sit down;" he is assisted by placing the hand on his hind quarters and pressing him down.

55. *To lie down and remain there.*—Under this is understood that the dog after having been made to lie down at a certain place will remain there until someone comes for him. In practice the dog is tied with a thin chain in the place where he is to remain lying down. A strap or cord should not be used, as the dog would learn sooner or later how to cut it.

At first the assistant is left with the dog to quiet him if necessary.

56. *Other tricks.*—The superintending officer may ultimately permit of the dog being trained in tricks. Though they are not necessary in the training of the war dog, still they are of value, inasmuch as they strengthen the intelligence of the dog and serve to make friends for him among the men.

Among these things are, jumping exercises of all kinds, seeking lost articles in the room, opening and closing the door, retrieving various articles named, etc.

Care should, however, be taken to allow none but the conductor of the dog to require these tricks of him.

57. To conclude the training the dog is also conducted by other men, since dogs which work only when with their trainer are not fit for service.

TESTING THE DOG.

58. Aside from the uninterrupted superintendence and direction of the training by the officers charged with the same, the progress of the training and the final result should be tested from time to time. These tests are made in the presence of the battalion commander; but when the training is not confined to the company itself, he may delegate that duty to some company commander.

The subjects of the test and arrangements for the same depend upon the age of the dog and

[1] This part of the training is facilitated if circumstances permit the use of a dummy man, before which the dog is taught to bark and which is used in the further preparatory exercises in the terrain.

the progress of the training. In regard to the latter, it would be well to inspect the diary (see Appendix 2), which ought to give full information.

59. Although these tests should extend to all branches, it is the efficiency of the dog in carrying messages that the greatest stress should be laid upon. It is not advisable to select the terrain on which the training has chiefly been conducted for conducting the tests, and it is recommended to select the ground unknown to the dog and at some distance from the garrison.

The tests are conducted in the manner and succession corresponding to the training. (No. 17 et seq.)

In order to get some idea of the efficiency of the trained dog, the distances to be traversed should be of sufficient extent. Distances of from 1 to 2 kilometers will suffice in ascertaining the dog's capability for carrying messages. But, on the other hand, it is also advisable to test the efficiency of the dog in traversing greater distances.

The dog should not stop en route, should go willingly, and should allow himself to be leashed willingly. Certainty of communication is preferable to speed.

It should also be ascertained whether the dog makes communication in a straight line over covered ground or open field, and whether he allows himself to be diverted by the scent of game or other things. In order to ascertain whether the dog will carry out his task, when interfered with by men, localities and frequented roads should be selected, where there is an easy chance of the dog being called or stopped. It would be wrong to use soldiers in thus interfering with him.

60. It is left to the discretion of the department commander to award prizes for specially fine work in training, payable from the funds for keeping war dogs.

The value and number of the prizes will depend upon the available funds, and should not be increased at the expense of the number of dogs kept or the expense of the breed.

II. Equipment of the Dogs.

61. The equipment of the dog consists of a collar, a report pouch, two lines (straps), and a chain.

62. The collar is 50 to 60 cm. long, made of strong leather 3 to 4 cm. broad, and provided with a simple buckle; to it is sewed a second strip of leather 2 cm. in width and bearing a small metallic plate marked with the number of the battalion and the name of the company. For instance—

Rif. Batt. 8
2. Comp.

To the same strip are also attached two or three strong brass rings, arranged about 10 cm. from each other. The rings serve to hook in the snap of the line. There should be several rings, so that some one of them may be easily taken hold of.

63. The message pouch is made of canvas, and about 5 cm. wide by 15 cm. long, arranged on the narrow side for closing by button or buckle. Throughout its length it is sewed to a strap about 2 cm. wide and 50 to 60 cm. long, which is fastened with a buckle the same as the collar.

64. The line is made of a calfskin strap 1½ cm. wide. The upper part is arranged for slinging (for the conductor of the dog) and provided with a buckle. The lower part is about 85 cm. long and terminates in a strong snap. Each conductor needs two lines.

65. The chain is a simple iron dog chain.

III. Combination of the Training with Other Service.

66. It lies with the company commanders to give the trainers sufficient opportunity for work with the dogs. In order that other duties may not suffer, well-conducted and well-instructed men alone should be detailed for this work. Corporals charged with special functions should not be detailed, because sufficiently occupied with their own duties.

When the superintendence of the training of the dogs of a battalion is in the hands of a single officer, the service can be easily arranged if the officer in fixing the service of the conductors consults the company commander.

67. In order to gain time for the training of the dogs without interfering with other duties, it is recommended to take the young dogs in hand in the winter months, during which the trainers can occupy themselves regularly with the pups, care for them sufficiently, and give them their first training.

In the spring the dog may be taken along to the firing grounds and practiced in leading in the leash and in carrying messages. By the time the fall maneuvers begin his physical development will have so far progressed that he is able to withstand the fatigue of the march, and in his work in carrying messages the distances can probably be increased to 1½ kilometers.

68. But in view of his physical development it is still necessary that a dog be spared, and it is advisable, therefore, when departing for the maneuvers, to leave the dog behind if his conductor for any reason is to be left behind.

If it becomes necessary to leave the undeveloped dog behind in the garrison without his trainer, it is advisable, in the absence of men suitable for conducting the training, to provide merely supervision and care for the dog and discontinue all training in the absence of the regular trainer.

69. During the autumn maneuvers there is frequently time and opportunity for further training and for employing the dog in such services as his training permits him to perform.

70. On returning to the garrison the training is continued, the distances to be traversed are increased, and the exercises conducted after dark. If the dog accompanies his trainer to and during service he must not be allowed to make trouble for the trainer; the dog is invariably leashed, and will thus not be in the way of the conductor in the performance of duties which require his undivided attention, as, for instance, field exercises, light infantry work, etc.

It is left to the battalion commander to decide on what duties the dogs may be taken along. Although, as a rule, it should be kept in mind that the dogs should accompany their conductors on service as much as possible, still there are some branches to be excluded as engaging the attention and action of the conductors completely, such as company and battalion drill, and all manner of preparatory exercises had with a view to the training of the men.

If the dogs are taken along to the autumn maneuvers, they constantly remain with their conductors on the march as well as during the exercises.

71. Since much of the time of the conductors is taken up by work with their pupils and the care of them, it is recommended to give them relief in other respects as much as possible. In all exercises, the autumn maneuvers not excluded, where the knapsack is carried, the same is discarded by the conductors of the dogs.

72. From what has been stated under No. 6, and from the details of the course of training, it is to be inferred that the employment of trained war dogs in peace and war is possible and may be required only within certain limits. When the battalion is acting alone, the dogs may be taken along on all duties and put to work.

If the battalion forms part of a higher unit (from the brigade upward), the dogs should be used only in the service of security. Moreover, the action of the dogs during battle is excluded if the battalion is part of a higher unit.

73. In the instruction of the men occasion should be taken repeatedly to discuss the object of war dogs, their treatment on the part of the men, and their relations with them.

IV. Bringing Up and Care of the Dogs.

74. In bringing up pups the greatest care is required.

During the first year the food should be confined to milk and dog cake. Subsequently, other food, such as is used by the battalion, may be added. Good, healthful nourishment has great influence on the pup's power of resistance against disease and on his physical development.

If the mother remains with the litter, the pups are left with her in the kennel, and the bringing up may take place also during the rough season; otherwise, special arrangements are to be made to protect the dogs from getting wet.

75. In view of the funds available the food of the older dogs will probably be limited to remnants from the men's table. Should it be practicable, it is recommended to add dog cake and to prepare a special food consisting of barley or oat grits cooked with water and fat.

76. The dogs are kept in a kennel made of brick or planks and arranged as follows:

(*a*) A large space provided along its long side with a bunk serves as a common room for the older and healthy dogs. The door of this hut has a flap permitting the dogs to run in and out.

(*b*) In the front of the hut some space is fenced in with a high wire fence for the dogs to run around in.

(*c*) Smaller huts are provided for bitches that are in heat or suckling.

(*d*) Similar arrangements are made for sick dogs and their huts placed at some distance from the others.

(*e*) The shelters mentioned under *c* and *d* are provided with inclosed spaces and wire fences in front, and such arrangement of the doors as to permit of free entrance and exit of the dogs.

In building new kennels the foregoing rules should be observed.

77. The kennels and inclosed spaces in front should be policed daily, under the direction of a corporal (conductor) of the day, by men detailed for that purpose.

The huts should be swept at least once a day, and the offal should be removed from the inclosed spaces in front at least twice a day. The feed vessels (metallic) must be scrubbed daily and be constantly kept clean; after use they are to be removed from the kennel.

The water supply should be renewed and maintained in a pure and fresh state.

78. Diseased dogs, with external or internal disease, should be removed from the healthy dogs as soon as possible and placed in the sick kennel. In their treatment, where experience is insufficient, good text-books are indispensable; if necessary, the veterinarian should be consulted.

79. Care should be taken that as far as possible only males be trained as war dogs. It is forbidden to castrate them.

VON SCHWEINICHEN,
Inspector of the Rifles and Chasseurs.

BERLIN, *May 31, 1893.*

APPENDIX 1.

——— Rifle Battalion.
——— Company.

Descriptive list of a war dog.[1]

Name.	Breed.	Descent.	Age (year and month of birth).	Bought or home bred.	Beginning of training.	Conductor of dog.		Cases of sickness.	Remarks.
						Name of conductor.	From; until.		

[1] This description to be entered at the beginning of the daily record.

APPENDIX 2.

Sample of daily record.

Year, month, day.	Kind of work.	Remarks of conductor.	Remarks of superintending officer.
1892.			
7.			
14, a. m.	Sending dog back from assistant to conductor.	Practice en route to target ground. Sent dog away with assistant; dog could not see me; arrived at a rapid gait.	
14, p. m.	.....do	Practice repeated.	
4.			
3, a. m.	Training in room, retrieving.	Fetches glove willingly and gives it up readily.	
4.			
5	No practice	Dog apparently sick since last night; have kept him in room.	
4.			
6	.....	Found it to be distemper; have put him in sick kennel. (State medicines given.)	

Laying Ahead and its Simplification.

[Read at Lyceum, Fort Sam Houston, Tex., December 12, 1895; forwarded for publication, under Paragraph II, General Orders No. 58, Series of 1895.]

PART 1.

This paper deals almost exclusively with matters pertaining to heavy guns, and incidentally to field artillery.

Before beginning, I shall call attention to one material difference between the heavy artillery and the other arms of the service.

The infantry, cavalry, and field artillery strive to meet and keep in touch with the enemy, always anticipating an encounter. By skirmishes and combats they lead up to a great battle.

Not so the heavy artillery. Theirs is a waiting rôle. They can not seek out the enemy and attack him. Thus days, or weeks, or even months may pass with no sign of actual hostilities in a seacoast fort.

Suddenly, however, in a day or night, or even a few hours, the crisis arrives. There is no skirmishing to test our methods and organization. There is complete quiet or vigorous fighting.

At times, a day or so may be of no special importance; at others, the very minutes count.

With this condition understood, I wish to call attention to the possible simplification of certain of our methods, whereby some of the work now required to be done in the heat of battle may be performed beforehand, when time is of no special value.

The first suggestion is the adoption of the decimal system in all problems of gunnery.

First, I would use but one unit for circular measure, viz, degrees and hundredths. The hundredth of a degree is greater than a second, but is as small an arc as is usually read in gunnery, and if it is necessary we can read to thousandths.

This changes a table long established, and for that reason may be ill-advised, but the following deviations from the decimal scale seem to have been made arbitrarily, without the sanction of general use or sound reason.

The first I note is the ratio of the value of one point to the range in the case of the field gun.

This ratio is 1 to 345; a more unwieldable fraction is difficult of conception.

With the heavy guns this ratio is simple, being 1 to 1,000.

The next curious condition to be noted is that all times of flight of projectiles are given, as they should be, in seconds and tenths, while the fuse scale on the 3.2-inch projectiles is expressed in seconds and sixth of seconds.

I imagine a gunner, in the heat of battle, struggling with the division of his range—say 2,750 yards, by the factor 345—to find out how many points he must set off to hit the target; or when his range table gives the time of flight—say 6.7 seconds—think of his mental gymnastics in figuring at how many holes beyond the 6-second mark he must punch—in short, how many sixths there are in seven-tenths.

The result is not difficult to foresee. The gunner will guess at the fuse cutting and, in aiming, will "hold off" the target; each of which is bad gunnery.

It may be best to retain certain subdivisions of units which are well established by long use, but when we further subdivide the lowest generally recognized unit, as, for instance, the second, by all means let us have the decimal.

Let us now take up the subject of the simplification of methods for "laying ahead."

Laying ahead means so directing and firing the gun that its projectile and the moving target will meet at the common point of their respective paths.

It will be easy enough to strike a target if it remain stationary, but if it is moving two new conditions are imposed, (1) the prediction of the target's position at a selected epoch; (2) the laying of the piece properly and the firing it at the proper time.

The first comes under the head of range and position finding, not discussed here. Suffice it to say that a target's position can be predicted with sufficient accuracy one minute ahead, that is, at minute intervals.

The second condition requires a method for obtaining data based on the predicted position and of applying them quickly in laying the gun.

The necessary data may be classed as (A) permanent data and (B) emergency data.

A. Permanent data comprise an accurate range table, giving, for normal conditions, elevation, drift, effect of wind, both longitudinal and lateral, effect of variations from normal thermometer and barometer, and the value at different ranges of one scale unit of elevation and deflection, expressed in yards.

B. Emergency data, depending on the range, etc., can only be had at the time of firing, and comprise:

1. The force and direction of the wind and the readings of thermometer and barometer and their combined effect on elevation for the predicted range.

2. The cross displacement of the target during the firing interval and flight of projectile; the effect of the lateral component of the wind and the drift for the predicted range, and the combined effect of the two on the laying ahead.

It is seen that all the data termed emergency involve range, while the prediction of the range is the work of the range and position-finding department, and must be made before the gunner can begin his calculations.

Unless the channels of the harbor restrict the movements of a warship to a known course, it will scarcely be safe to predict a position more than two minutes ahead; but this is very short when we consider how much has to be done in the interval elapsing between the prediction and the firing of the gun.

Briefly this work is as follows:

Observing the target; reading the angles; sending in the angles to the plotting station; plotting the observed position; predicting and plotting the next position. So much for the range finders, now for the gunners.

1. Wind; its velocity and direction is determined; the velocity divided into longitudinal and lateral components and each multiplied by its corresponding factor from the range table; then these results set down as positive or negative variations in range and deflection, respectively.

2. The barometer and thermometer; each read beforehand with respect to any variation from normal, and these variations each multiplied, respectively, by its own factor, from the range table, give variations, positive or negative, in range.

3. The total cross displacement of the target for the plotting interval is divided by that interval, expressed in seconds, and the result multiplied by the time of flight of the shot plus the firing interval, both in seconds. The result, positive or negative, is the number of yards ahead that the piece must be laid for that course.

4. The drift for the predicted range is taken from the table.

5. Combine algebraically all the above-noted variations in range and divide the result by the number of yards which at that range correspond to one minute of elevation. The result is the correction to apply to the normal elevation.

6. Add algebraically all the displacement results noted above and divide by the number of yards which, at that range, correspond to one point of deflection. Set off these points on the sight.

7. Sight on the target and follow it till the proper interval has elapsed, then fire the piece.[1]

On the blackboard will be seen the calculations just enumerated and the data on which they are based.

Example on blackboard.

Previously determined data:

Wind	25 miles per hour.
Firing interval	3 seconds.
Barometer	29.5″=0.5″ below normal.
Thermometer	90°=30° above normal.
Direction of target motion	left to right.

Emergency data:

Range, predicted	3,000 yards.
Wind, direction to line of fire	8 o'clock.
Cross displacement of target per minute	150 yards.

Calculation.

[Ruckman and Whistler tables for the 8″ M. L. R.]

	Yards.
Wind: 25 by 0.5 by 2.23	=28
Barometer: 5 by 2.14	=11
Thermometer: 30 by 1 26	=37
Total	76
Yards to the minute of elevation	6.7=11′ elevation.

Displacement:

Wind: 25 by 0.8½ by 0.81	=17
Drift	6
Target displacement (normal): $\frac{150}{60}$ (7.71+3)	=27
Total	50
Yards corresponding to one point	3=17 points left.

PART II.

The foregoing clearly shows that in quick firing there are two alternatives:

1. To apply all the refinements of laying, as indicated above, with a gain in accuracy and loss in time.

2. To omit some or all of these refinements with a loss in accuracy and a gain in time.

Our object is evidently to gain all accuracy possible with a minimum loss of time. This will be attained if any system be adopted by which the calculations above mentioned may be shortened.

It is with the idea of simplifying these calculations that I submit the following suggestions as to normal range tables, and also my scales as time savers:

[1] In indirect fire these values will not be set off on the sight. Whatever method is used, two readings, one for elevation and one for azimuth, must be set off somewhere, and whenever this is done the above corrections will be applied.

I suggest that for rapid work there should not be one range table with factors, etc., for corrections, but tables actually made out and printed for the following causes of variation:

1. Change in I. V., if this is liable to be sufficient to make it desirable.

2. Change in relative altitudes of gun and target if the tidal change amounts to enough to make a practical difference.

3. For difference in weight of shot.

The shot may be grouped as to weight.

(It seems that the variation in weight of the shot for the 8″ M. L. R. from the standard is greater than the necessities of careful casting require.)

4. Jump must be included in all normal range tables.

All these tables may be prepared beforehand and each plainly marked, so that when the conditions involved are known the proper table can be immediately taken up.

The appearance of Whistler's Graphic Chart marked an era in our gunnery, and it is most excellent for target practice when time is plentiful. But under fire we must drop all methods that require any calculations based on emergency data that are more complicated than simple addition, because there will be neither time nor coolness for their performance.

For this reason I suggest a number of normal tables for the several conditions of firing or variations in the permanent data.

So much for the preparation of tables which will require the expenditure of much time beforehand, when it is of no importance and which will save time to the artillerist under fire when time may be synonymous with life and success.

Having these normal tables to start with, I submit a system of scales, planned by me, to greatly shorten the work of applying corrections for variations due to changes in the emergency data.

In their use no calculation more complicated than simple addition is required. The scales are set from data sent in and the results are read off in such units as minutes and points which are adapted to immediate application in laying the guns.

As models accompany this paper no description of the scales is necessary, and I give instead directions for setting up and using the models.

ATMOSPHERIC SCALE.

This is for use with thermometer and barometer. (See models Nos. 4 and 4′.)[1]

These two forms are practically the same and one or the other may be used according to the relative rapidity of use developed by practice.

To use No. 4 turn the index arm to the range marked on outer circle. Find on the arm the reading from the thermometer. Project, by eye, this point on the nearest horizontal line marked off as a scale and read from the (block figured) scale the $\triangle \varphi$ for that instrument.

Do similarly for barometer, using the red scale.

To use No. 4′ use the intersections of the radial range lines and circles of instrumental reading instead of the index arm.

WIND DEFLECTION AND DRIFT SCALE—WIND-ACCELERATION SCALE.

These two have been combined into one model. (See Nos. 1 and 6.)

If in use it is found better to do so these two may be separated and operated by one person at each.

The setting up of this model will be explained below.

[1] Drawing of 4′ omitted.

To read this combination scale the inner part, No. 1, is oriented till the arrowhead, near the word "Points" on the scale, is directed toward the target, the observer, facing also toward the target, has the scale in front of him.

The index arm is set on the outer part (No. 6) at the given "o'clock" or component, according as the one or the other system is used at the wind vane, and the velocity of the wind from the anemometer is found in this arm. Then—

(*a*) For deflection, project this point of the arm vertically on that horizontal chord of the circle which is marked with the given range. Refer this projection to the curved lines of points, and read the resulting points of deflection due to wind and drift.

(*b*) For $\triangle \varphi$, proceed similarly by projecting the point of the index arm horizontally on that vertical chord marked with the given range, and read from the curved lines of minutes the $\triangle \varphi$ for wind.

If use develops the fact that interpolations by eye are not accurate enough or consume too much time, additional lines may be put on the scales.

TARGET DISPLACEMENT SCALE.[1]

This scale measures in points the amount of cross displacement (normal to the line of fire) of the target during the firing interval and flight of the projectile; the measurement is based on the cross displacement of the target during the plotting interval, taken here as one minute of time.

The use of this scale presupposes the plotting of the target's position at fixed intervals (one minute for this scale) and the prediction of its position for the next epoch. It matters not how this is done or what system is used provided simply that the points are plotted on a sheet where also the firing point is plotted.

Having plotted the "last" and the "predicted" positions of the target, measure the range to the predicted position. Pass the right edge of the range ruler through the left-hand one of these plotted points. Apply the left edge of the scale to the right edge of the ruler and slide it along until the right-hand one of these plotted points is seen (through the scale) to fall on the proper range line (given or interpolated by eye or by the addition of other lines to the scale). Refer this last-mentioned point, seen through the scale, to the curved lines of points, and read the result in points.

If the range ruler be so constructed that its left edge produced is the one that passes through the center of motion, then in the foregoing substitute the word "left" for "right" and "right" for "left."

If both edges prolonged pass through the center of motion, then in all cases use the scale by passing the edge of the ruler through the "predicted" position, and apply the scale on the left or right according as the target motion is from right to left or the reverse. When the scale is applied to the left edge of the ruler, it will be face down, and the figures and letters reversed, but this is of no material difference.

To set up and operate the wind deflection and drift and wind acceleration scale, the condition must be known; there are two distinct cases.

1. Suppose a central wind clock and anemometer for all or a number of groups of guns, and the data therefrom sent in referred to the directing (XII to VI o'clock) line of the clock.

Set up permanently the outer part of the scale (marked No. 6) with its directing line (XII to VI o'clock) parallel with that of the central clock. Then—

(*a*) If the gun is to be laid by azimuth (target not visible), as by the Rafferty relocator or otherwise, we orient the inner part of the scale (marked No. 1) to the given azimuth by means of the graduations on the inner edge of No. 6 and the outer edge of No. 1. The directing line of

[1] To be engraved on horn or some transparent material.

No. 1 (arrowhead) will then be parallel with the line of fire. The index arm is set by the graduations on No. 6, and the reading is made as before explained.

This scale presupposes that the directing lines of the central clock and central range finding system are parallel. If this is not the case the graduations will be changed to suit.

(*b*) For barbette firing the outer part (No. 6) is set up and the index arm oriented as before (case *a*). The inner part (No. 1) is now oriented by sighting its directing line on the target, and the reading is as before.

2. Suppose each gun or group of guns has its own wind vane or clock.

The outer part (No. 6) is fixed permanently as the dial of the clock, and a pointer, traveling over its face, takes the place of the index arm, being graduated like it.

The directing line is parallel with that of the range finder, or the graduations changed to suit. Then the inner part (No. 1) is oriented on the target (*a*) in indirect fire by setting off the azimuth as in case 1, (*b*) in direct fire by sighting on the target. The reading is as before.

REMARKS.

There are some inherent errors in the use of these scales, but it is believed that they are well within the limits of accuracy in laying.

These scales give corrections based on a mean normal table.

When this mean normal is not the table used, the scale corrections will be a little off, but still practically correct, being incorrect by a variation of a variation.

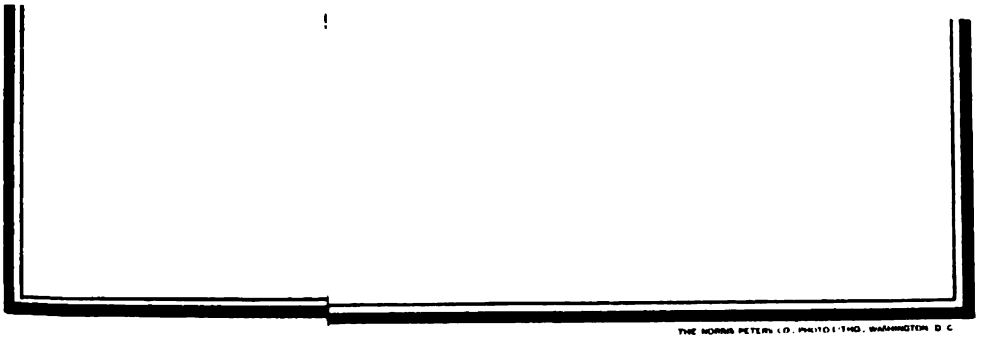
MODELS.

These are rough, and many improvements can be made as to material and workmanship and possibly in the construction of the scales, but the idea of presenting results, obtained graphically and expressed in the final units required in laying, will remain as the ruling principle.

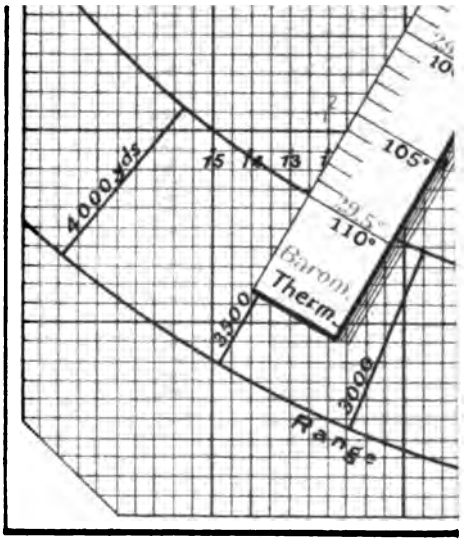
These models were made by me without special facilities or material, but I think they are suited to a practical explanation of my ideas, and may even be used in a test.

Accompanying scale No. 5 there is a section of a plotting sheet with two examples in the use of the scale worked out.

HENRY C. DAVIS,
First Lieutenant, Third Artillery.

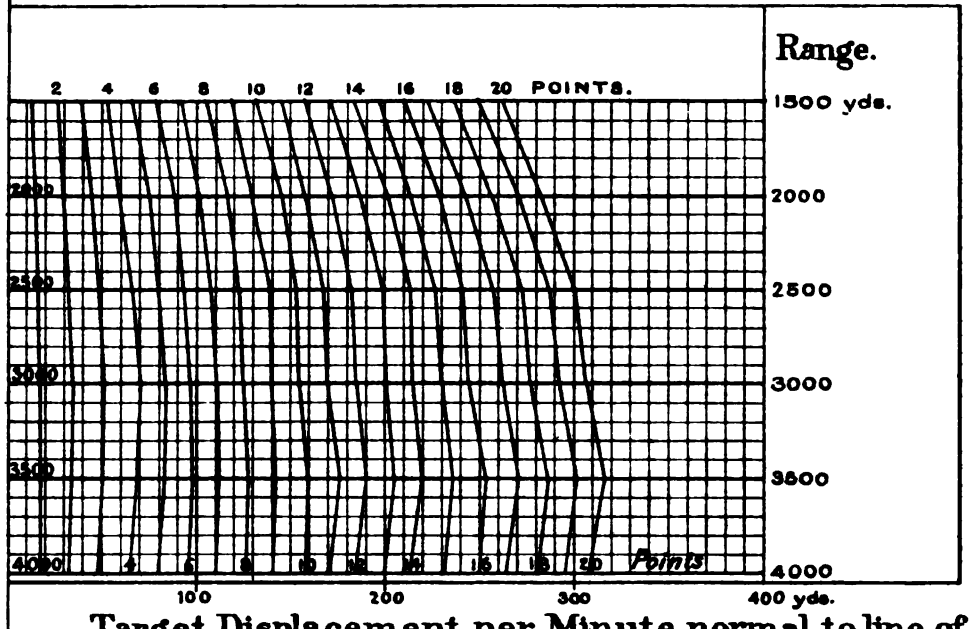


THE MORRIS PETERS CO. PHOTO-LITHO. WASHINGTON D C


4000 yds
15
14
13
105°
110°
Baron.
Therm.
3500
3000
Range

Nº 5

DAVIS' DISPLACEMENT SCALE – 8 IN. M.L.R.



Plotting interval = 60 secs.
Firing interval = 3 secs.
One Point = 1/1000 Range.

Target Displacement per Minute normal to line of fire.

THE JUDSON PRITCHETT CO. PHOTO-LITHO. WASHINGTON, D. C.

Smokeless Powder: Its Influence on Tactics.

TRANSLATED FROM THE ORIGINAL BY PERMISSION OF CARLOS VON BANUS, COLONEL OF ENGINEERS, SPANISH ARMY.

[The United Service Magazine—England.]

INTRODUCTORY.

Before studying the modifications which may be introduced into the science of tactics by the adoption of smokeless powder, certain facts concerning the psychology of the battle should be brought to mind, for it can not be forgotten that, after all, man, and not his armament, is the principal factor in war, and that it is man who places the limit on the forces which can be utilized therein.

For this reason ballistic effects can never exceed the limits imposed by human nature. It would, for instance, be of little use to invent a small arm to carry to a distance of 20 or 30 miles, owing to man's power of vision being limited. Mathematical precision can not put an end to the nervous excitement produced by fatigue and danger; rapidity of fire, moreover, has limits determined by the exhaustion which it causes the firer.

The effects produced on the soldier by the battle are of two kinds, viz, physiological and psychological; and these are so intimately connected that it is not easy to define the limits between them.

There is, first, the nervous excitement caused by the unpleasant whistling of bullets. This constantly recalls the danger present, and, even supposing that projectiles were not capable of causing death, strong excitement would still result, similar to that produced by the noise of a swarm of mosquitoes, although we are well aware that the bite is not mortal. And this result will be the same whether powder is or is not smokeless.

Then, there are the psychological effects, due to the impressions received by the soldier on seeing his comrades falling around him. These it is (the wounded) who are unable to retreat; an evident proof that those who do (the sound) do so, not from being compelled by a material reason, but from psychological motives. The idea of danger will at times take such absolute possession of the soldier's mind as to efface all else; he becomes convinced that if he does not endeavor to avoid it, he will die, and seeks relief in the proceeding which he believes to be the best, although it does not always prove so—he runs away.

Almost all tactical writers appear to forget the abnormal condition of the soldier in action, and yet, without taking this into account, battles could not take place; for if it did not dormify, for the time being, the instinct of self-preservation, all would fly in the face of danger.

If we desire to find an explanation for this condition, it is not difficult to do so. A man who does mechanical work does so at the expense of his muscles. The oxygen drawn by his blood gives

rise to chemical combinations which take place when work is done at the expense of his organic system, in consequence of which he becomes fatigued and feels the necessity for repairing his forces, i. e., for nourishment. Eating is equivalent to adding carbon to the fire of a steam engine. But the soldier who fights not only does mechanical work, he does more. A workman who, for example, strikes blows with a hammer, performs muscular work, but during the process he can allow his thoughts to run as he pleases. But supposing that he has to strike a certain number of blows a minute—the question may vary—then he must fix his attention on counting the blows, and to the muscular work is added the mental; and should the number be great, the emotion produced by the desire to complete the task and the fear of not being able to verify it gives rise to a nervous excitement which also produces work. And although the mental and nervous work can not, like the muscular, be measured, they do not for that reason cease to exist and to be felt. Everyone knows how excessive mental labor wastes the system. To this cause of excitement must be added the fatigue produced by marching and remaining on foot for a considerable time, and the weakness resulting from want of nourishment if the combat is prolonged.

As a consequence of this abnormal state the circulation of the blood is interfered with, giving rise to cerebral congestion, the senses do not act with regularity, and a number of sensations pass unnoticed. Thus is explained how soldiers receive slight wounds without being at the time aware of the fact.

It has been said that smokeless powder will cause fire to be more accurate, since the target will be clearer, owing to the absence of smoke; but with this we do not agree. In the first place, distances can not always be estimated with accuracy, and, secondly, the majority of soldiers in action fire without aiming, frequently without seeing the target. The soldier is not like the sportsman; the latter fires with deliberation and to hit, the former to relieve his nervous system and to drive away fear, and because he instinctively knows that if he wishes to kill his enemy he must fire.

Some contend, also, that the absence of smoke will enable the soldier to see more clearly the ravages produced by the enemy's fire, and that this will have a demoralizing influence. But with nonsmokeless powder he could not avoid seeing his comrades falling at his side and the wounded as he advanced. In the latter case, owing to the dense cloud of smoke, he could not know what was hidden, and is it not an attribute of human nature to have greater fear for the unknown than the known?

The advantage which can not be denied in smokeless powder is that it will facilitate the control of officers in command of units; before, when all was enveloped in smoke, they could neither see the enemy nor their own men. Now this will not happen. By means of signals they will be enabled to make themselves understood by their subordinates; they will not stumble unexpectedly upon obstacles which smoke concealed, and will find it less difficult to keep in touch with collateral units whose movements can be seen.

Who will say that the adoption of the new powder necessitates alteration in the tactics of the battlefield? The subject is worthy of study, and opinions vary. Some consider that tactics will undergo radical modifications; others hold the opposite view. Before coming to a decision, we will consider the question for each of the three arms:

INFANTRY.

When entering upon the tactical study of the effects of smokeless powder on field warfare, there appear both advantages and disadvantages. The infantry soldier who fires with this powder at once obtains the advantage of having a clear field of fire; but, on the other hand, if he is unprovided with cover, either natural or artificial, there is no protecting cloud of smoke to conceal him, and, should his enemy have found cover, he, on his side, is more vulnerable than when the smoke showed his position.

In our opinion, the supposition that troops can be exposed to fire without knowing whence it comes is more or less fanciful, and the occasions upon which it will be possible for an enemy to open fire without disclosing his position very few. It might happen in two cases, viz, (1) when he is protected by some natural cover (bank, undulation, etc.) or artificial (dwelling, etc.), and (2) when he is intrenched.

In the former case, if the cover is obtained from a wood or village, it will be evident that the fire comes therefrom unless it is assumed that the officer in command is without intelligence. By using nonsmokeless powder a veil was formed in front of the wood or village, which concealed in the first instance the trees, in the second the windows or roofs, by which the enemy was protected; consequently, if there is no smoke his position will more readily be seen. When, however, undulations or folds of the ground provide the cover, the absence of smoke will make it a difficult matter to ascertain his position; and this is undoubtedly the case in which the use of the smokeless powder gives the most advantageous result.

If the enemy is intrenched, his intrenchments will either be concealed by the contour of the surrounding ground or the reverse. In the former case the above remarks will apply, and the maximum advantage will be obtained. If, on the contrary, the intrenchments are visible, their crest lines, not being hidden by smoke, will show up more clearly against the horizon.

Thus we see that the absence of smoke is not an unmixed advantage; but none can say that it is not an advance. In war two objects are aimed at; the first, to inflict injury on your opponent, and the second, to avoid the injury which he is endeavoring to inflict upon you. And since victory will be obtained by the side which succeeds in first annihilating (relatively) its adversary, it is clear that the offensive condition must always occupy the chief place; and, although it is true that smoke forms a protecting mask, it none the less interferes with the clearness of the field of fire, which is of the first importance upon the battlefield.

And here enter the psychological conditions above referred to. Man is the chief factor in war, and the excitement of his nervous system does not allow him to take full advantage of the advances of science. Smokeless powder will give a clear field of fire, but there must always remain the difficulty of accurately judging distances, and, above all, the fact that the number of soldiers who shoot well is very small, the majority not even taking aim.

Taking these circumstances into consideration, the use of the new powder would not appear to render any essential modifications necessary in the tactics of small bodies. But on a battlefield the whole of one's forces are not actively engaged throughout. The supports and reserves, which were formerly concealed by the smoke of the firing line, have now lost this means of protection, and can be fired upon by units specially detailed for the purpose; and, since it is agreed that there is nothing more trying to the steadiness of a body of troops than to be under fire without replying, the position of the supporting lines has, apparently, become very precarious. But this is not the case to so great an extent as appears at first sight.

First, because attention is always paid to the greater danger which is caused by the nearest troops, i. e., the firing line; for which reason it will be difficult to restrain even the units, specially directed to fire on the reserves, from attacking the firing line. Second, because day fire directed against them must be at long range, and can not, therefore, have great results. Finally, on the defense it will generally be easy to conceal the reserves, and during the attack the effects of the enemy's fire can be avoided by movement. Some writers suggest the extension of the supports as a means of diminishing losses; but, in our opinion, such a solution is not feasible, troops in extended order being very liable to get out of hand. The chief advantage of this formation is that a small target in depth is offered to the enemy, while at the same time a good fire effect can be produced. And this is certainly a great advantage, but dearly bought, since it necessitates decentralization, and so diminishes the control of the officers. For this reason, opening out should be delayed as long as possible, and resorted to only when troops come into action. The soldier, as

above stated, who advances without firing when exposed to fire is liable to complete demoralization; consequently, if the intensity of fire to which the supports are subject is so great that it is found necessary to extend, it will be better for them to at once advance and join the firing line; they will there probably suffer greater loss, but will, at least, be inflicting loss in return.

Actual battle formations are not capable of radical modifications; the various "lines" are necessary. In the future, as in the past, there will be only one way of deciding a battle, viz, to get to your enemy, or at least close enough to convince him that you have sufficient power to drive him from his position. And this result can only be obtained by arriving in mass, i. e., with a strong force. But the direct advance of troops in close formation is no longer possible in the face of modern arms of precision; hence it becomes necessary to protect the approach of the masses, whose function it is to deal the decisive blow by means of a firing line. The firing line is merely an expedient for covering the remainder of the force, which unites with it at the decisive moment, cost what it may, to terminate the action.

With the suppression of smoke the advance against a position will, no doubt, be somewhat more difficult than formerly; but the danger, in our opinion, will not be greater until within 500 or 600 yards of the enemy. Beyond this point, when distances can be judged with little difficulty, when the errors of aiming are small, and where the trajectory is altogether dangerous, the real trial for the attacking force will commence—a trial which before was delayed until within 300 yards of the position. This last phase of the battle must of necessity be short, and every effort will have already been made to shake the defender. The firing line, extended at 1,000 yards from the enemy, will have advanced, more or less reenforced, to within 500 yards of his position, taking advantage of formations of the ground and at times throwing up shelter trenches for protection. The remaining lines will have followed in rear, keeping under cover as much as possible, safety being sought in movement and in formations of little depth (which may have been reduced to single rank, but without extending), in the event of the ground not giving cover. At 500 yards from the position all the component parts of the first line will join the firing line, and from this point its advance will be rapid and vigorous, assisted whenever necessary by the masses which follow, which will have been closed up sufficiently to support and protect it at the critical moment.

We do not wish the question of cover to be misunderstood. Troops should not be needlessly exposed, but war is not a game of hiding, and with men whom one is always attempting to conceal, it will be impossible to obtain decisive results. The enemy can not be expelled from his position by stalking him, and a vigorous advance is indispensable. If he has been much shaken, the assault, owing to the absence of smoke, will, perhaps, be a less difficult task than formerly, as he will clearly see the impending danger, and may evacuate the position.

Some attention has been paid on the Continent to a work by Captain von Goltz, entitled "Independent patrols." This German officer suggests the formation of "independent patrols," consisting of 8 marksmen, selected from each section. A company in the German army is divided into three sections; there would, therefore, be 24 selected marksmen per company. These "patrols" are for a double object—to reconnoiter the enemy's position, and to draw his attention to themselves, while covering the advance of the infantry. Owing to the smallness of the target they offer, the writer considers that they would, without great loss, be able to approach to within 600 yards of the enemy, and on arriving at this point suggests that they should conceal themselves as far as possible and open fire. Meanwhile, the officers of the staff, taking advantage of high ground, will examine the enemy's dispositions, cavalry patrols being at the same time sent out to reconnoiter. The first line of the infantry will, at 2,000 yards from the position to be assailed, be extended and endeavor to advance with the utmost possible rapidity to within 600 yards of the enemy. For making good casualties, and to urge it on, a second line will closely follow the first. At 1,000 yards from the second line will follow what Von Goltz calls the "shock

troops," with fixed bayonets, who will, at about 400 yards from the enemy, join the lines which precede, thereby giving sufficient impulse to carry the whole right up to the position. At 1,000 yards in rear of the "shock troops" follows the reserve, the cavalry.

It can not be said that Von Goltz's ideas are altogether original. Some of his assumptions, moreover, appear exaggerated. We can not, for instance, admit that infantry are liable to suffer severely from fire at ranges between 2,000 and 1,000 yards. At such distances, movement, undulations of the ground, and the selection of suitable formations can do much to diminish its effects.

It also appears of doubtful expediency to send the "exploring patrols" to within 600 yards of the enemy, when not closely followed by their own firing line. Such patrols, far from their comrades, will feel weak—will, in reality, be very much exposed, and may, possibly, think more of concealing themselves than of "exploring."

The French generals, Ferron and Luzieux, are agreed that attack formations can not be radically modified, and differ only in minor details. The latter suggests that the battalion, when formed for attack, should consist of three lines—the two first, the firing line and supports, composed of three companies; the reserve of the fourth. The reserve to be at 500 yards and the supports at 250 yards from the firing line. Independent fire to commence at 600 yards from the position, with sights, which need not again be changed, adjusted for 400 yards, and aiming at the feet. According to General Ferron, the decision of the infantry duel will take place between 800 and 400 yards from the position attacked, between which distances the supports and reserves will be absorbed into the firing line. In rear will follow forces in compact formation to deliver the final assault. He considers, further, that the firing line should be extended at 2,000 yards from the enemy, that its advance should be rapid, and that it should be reenforced by the supports and reserves whenever a halt is necessary. It would serve no useful purpose to discuss to any great extent the question whether the new powder confers greater benefits upon an attacking than upon a defending force. The absence of smoke is a material advantage to the defender, who can occupy positions which give cover. The attacker, on the other hand, must very often, if not always, advance unconcealed, and, with the absence of smoke, loses a means of protection. In some cases formations of the ground will enable him to approach under cover, but these will be exceptional, and, sooner or later, he must disclose himself.

But in the future, as in the past, the moral advantages will always be with the attacking side, since offensive action implies moral superiority and instills confidence. It will be necessary to convince the soldier that danger decreases with the advance, and that the longer it takes to reach the enemy the greater will his danger be.

ARTILLERY.

It is clear that smokeless powder will exercise some influence on the employment of the other two arms. With artillery this will, perhaps, be greater than with infantry, since this arm generally fights at a distance, is more under the control of its officers, and is less demoralized by an enemy's fire; as a consequence it can take fuller advantage of scientific improvements.

The adoption of the new powder confers upon artillery the following advantages, viz:

(1) It leaves a clear field of fire, and will render it possible, therefore, when firing upon artillery, to distinguish the guns from the intervals, and to keep the fire of one's own guns directed on the former. Masses of cavalry or infantry, which before were able to pass unnoticed behind a veil of smoke, will now lose this means of concealment.

(2) The observation of the effect of fire will be simplified. With nonsmokeless powder the effect of projectiles which burst in rear of the smoke caused by the enemy's guns could not be seen. The effect of long-range fire will now be observed as easily as that of short.

(3) Good artillery positions will more easily be found, since it will be unnecessary to take into consideration whether the wind will carry the smoke of one battery in front of others. In calm

weather, also, the smoke which hung in front of a battery frequently obscured the view and interfered with the service of the guns.

(4) It will be possible to use indirect fire without the enemy being able to easily ascertain where the battery which is firing is situated.

Besides these advantages must be placed certain disadvantages, viz:

(1) A battery in action will be deprived of the protection given by a veil of smoke. The groups of gunners will be visible and will be liable to be picked off by marksmen, who are the worst enemy artillery has to contend against.

(2) In open country it will be more difficult to conceal the limbers, wagons, teams, etc. The smoke formerly screened them from view; they can now be destroyed with greater facility, and the casualties which teams suffer are of great importance, as they affect mobility.

(3) The movements of batteries will be more difficult, since advantage can not be taken of the smoke to conceal them.

Let us examine the real value of each of these.

The first advantage is important, since the enemy will be compelled to keep his masses at a distance, particularly his cavalry, whose intervention at an opportune moment during a battle will be more difficult. The absence of smoke will also make it less easy to surprise a battery, because unless the formation of the ground conceals an enemy's approach, there will be nothing to prevent his being observed.

The second advantage is also important, since the range can be more quickly ascertained, an operation which often causes precious moments to be lost. The cloud of smoke in front of an enemy's guns, which was used for this purpose, was defective, as it occupied a large space and was movable. Fixed points can now be taken in front or in rear of his battery. The smoke in front of guns also frequently interfered with the officer who was directing their fire; he was compelled to take up a position where the view was unobscured, and such could often not be found near the battery. In the absence of smoke, an officer in rear of the center of his battery will, in most cases, be able to direct its fire, sometimes even with his voice.

With respect to the third advantage, there is no doubt that in certain countries and climates it will allow greater freedom in the use of artillery, and will enable fire to be opened indifferently from either flank. It will, besides, permit of guns being placed in tiers, since with the ordinary powder the smoke which the lower batteries produced on rising formed a cloud in front of the higher. Moreover, in the absence of smoke, which disclosed the position of guns and interfered with their service, they may, in certain cases, without inconvenience, be placed at intervals of 5 yards or 6 yards only, so reducing the front of a battery to 30 or 40 yards, thereby bringing it under better control of its officers, and enabling it to take up positions before denied to it owing to there being insufficient space. As a rule, however, such small intervals should not be used, 10 yards at least being kept, since the battery becomes crowded and more exposed to the effects of an enemy's shells which fall near it. From this we see that smokeless powder will make it easier to find good artillery positions by increasing their possible number.

The fourth advantage does not affect field warfare to any great extent where indirect fire will seldom be used. This can not be altogether overlooked, however, especially if field howitzers are introduced. But at present it is not of so great importance as the others. On the defense when a position can generally be selected and the nature of the surrounding country is known, this class of fire may perhaps be employed, and there is no doubt that if the ground gives good cover to the battery, it will not be easy for an enemy to ascertain its exact position, and it will, consequently, be able to inflict injury with little loss to itself.

Concerning the disadvantages, the first is of a very serious nature, especially when artillery is engaged with infantry. The conditions are very unequal, for while the former offers a target of great magnitude and easy to hit, the effect of guns upon extended infantry is almost nil. This

fact may prevent artillery advancing as close to the enemy as it has been accustomed to during the final stage of the attack.

The second of the disadvantages is also very serious, for the reasons already given, and, at times, the only remedy will be either to shelter the teams with earthworks constructed for the purpose, or to retire them, thereby rendering movement difficult.

The third disadvantage is not so serious, because opportune moments can be seized for a change of position. Besides, when a battery is on the move it is not easy to cause it vital injury, especially if the movement is carried out with rapidity.

Many writers lay great stress on the necessity for concealing batteries, some even going so far as to state that under no circumstances should a battery be so placed that it is not hidden from view. We confess that we are somewhat skeptical as to its possibility. A battery offers a large target, and its groups of gunners can not easily be concealed. Furthermore, artillery can not give up its primordial conditions, which are to see and to obtain a good field for fire, and these are difficult to fulfill if it is so placed as to be completely invisible. This is recognized in the French regulations: "Avant tout, voir: ensuite, si c'est possible, ne pas être vu."

The anxiety to be hidden can only lead to timidity, not to an energetic offensive. The soldier who thinks the endeavor is always being made to conceal him will with difficulty be induced to expose himself to danger.

With regard to the distances at which fire should be opened, we think that for the attack of a position artillery should come into action at 2,500 yards from the enemy, in order not to prolong the battle, and beyond this range little result can be expected. Some writers, however, consider that in the future, owing to the anxiety to surprise one's adversary and to the desire to obtain a first advantage, the temptation to open fire as soon as his dispositions have been ascertained, even though it be at a distance of 4,000 yards, will not be resisted. As it is not at such ranges that decisive results are obtained, this desire should be firmly repressed.

We can not agree with the opinion held by others that little advantage will be gained by advancing the artillery to closer ranges than 2,500 yards during the last stage of the attack, the argument being that when the atmosphere is clear the necessity for so doing is not apparent, the resulting gain being disproportionate to the attendant danger.

The advance of the artillery is not only to increase the material, but also the moral effect, by encouraging the infantry with its presence; and if it continues to fire from a distance it may injure its own infantry. Finally, when the position has been captured, the artillery must quickly take up a position to harass the enemy's flight. For these reasons, in our opinion, the majority if not the whole of the guns should be advanced in the final stage. This advance, which before could be to within 800 yards of the position, should not be nearer than 1,200 yards with the modern rifle. According to Captain Moch this limit should be 1,500 yards, to General Ferron 1,800 yards, and to General Luzieux 1,200 yards.

Smokeless powder will more frequently permit the use of artillery en masse, because (*a*) it is easier to find positions, (*b*) the intervals between the guns can be reduced, and (*c*) there is no smoke to cause the difficulties already referred to. The unity of command is facilitated and with it the concentration of the guns.

It appears to us that artillery has now acquired a greater value; in the future more than in the past the gun will open the way for the rifle.

CAVALRY.

It is an exaggeration to say, as many do, that smokeless powder will render cavalry valueless on the battlefield. The same opinion was expressed upon the introduction of firearms; in fact, whenever infantry has acquired some advantages in armament, owing to the progress of science, the disappearance of cavalry as a fighting arm has been prophesied. Experience has never con-

firmed it. During the battle there will arise opportunities for the intervention of cavalry—for instance, when the opposing infantry is already almost broken and on the point of giving way, or when it can be surprised, being already engaged with the other arms; or when, the battle being lost, it is necessary to arrest the pursuit at all costs, and the infantry is unable to do so. In this moment of supreme affliction, as is well known, the cavalry must sacrifice itself to save the troops most compromised, and whether the powder used is or is not smokeless is of no importance. Cavalry on the battlefield has been and always will be the ultima ratio. To take advantage of an opportune moment to determine a victory almost won, or to sacrifice itself—such will ever be its duties.

Smokeless powder does not modify them. It may sometimes compel their arm to keep at a distance on the battlefield; and this will tend to give it greater independence. At all times a cavalry commander should be capable of recognizing opportune moments for attack, and should act quickly. During a battle the infantry and artillery are always, so to speak, in action; cavalry, however, can frequently rest. But when once it is committed, its task is perhaps more difficult than that of the other two arms.

But it is clear that since the chief agent of cavalry is the horse, which does not improve like the gun or rifle, the duty of this arm will become more difficult with each improvement in artillery and infantry armament. At first sight, indeed, the attack of infantry by cavalry, unprotected by smoke, appears a folly; but the rapidity with which cavalry moves makes it a difficult target. Furthermore, smoke prevented the infantry from seeing its approach. This will not now happen, and it can not be denied that the sight of cavalry, advancing at great spead, may of itself be sufficient to cause a panic among infantry which is already on the point of giving way.

Some writers consider that in future wars cavalry will not appear on the battlefield, but will be reserved solely for screening and for reconnoitering purposes, which, they think, will be fully sufficient to tax its powers. Others, on the contrary, believe that opportunities of repeating the deeds of Bredow and Bechtolsheim will not be wanting. A general who can only spare his cavalry to restrain a victorious enemy will not hesitate to use it, since he will prefer to lose that arm rather than to be without an army. In our opinion, cavalry has not lost its technical value in speed, in surprise, in flank, and, if possible, rear attacks.

CONCLUSION.

In conclusion, we are of opinion that the use of smokeless powder will not necessitate the introduction of radical modifications in the tactics of the three arms. As a German writer says, "every advantage of the new powder is so evenly balanced by some disadvantage, and each disadvantage appears so small by reason of the attendant advantages, that the future will not differ from the past in any important point." It will exact stricter discipline in armies and increase the probabilities of success for the side which is braver, better instructed, and more skillfully led. More than ever, victory will be gained by those most worthy of it.

R. J. BYFORD MAIR,
Lieutenant, Royal Engineers.

The Functions of the Army and Navy in the Maintenance of the British Empire.

By Capt. WALTER H. JAMES,

Field-marshal the Right Hon. Viscount Wolseley, K. P., G. C. B., G. C. M. G., in the chair.

[The United Service Magazine—England.]

DISCUSSION; ITS CONCLUSION.

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Lord WOLSELEY. * * * I do not intend to add much to this discussion. I wish that more officers had spoken on the various topics that have been brought before us, because they have been so numerous that I thought as there are so many officers here they would take up their own special subject, and give us their views upon it. I feel myself that in attempting to say anything upon the lecture, as the lecturer has told us this moment, would require almost a volume, and to deal efficiently with this subject, or even to reply fully to what he has said, would require not one volume but many. In the course of the lecture, which has been to me a most interesting one, there are one or two points on which, naturally, of course, we do not all agree, and there are one or two topics in respect of which I do not go as far exactly as the lecturer does; but as for the lecture, in which we have all taken so much interest, it may seem hypercritical to criticise anything he has said. The only point that he brought before us, and which I do not agree with, is that he stated in the early part of his lecture that the loss of sea power, of the supremacy of the sea, would mean starvation to England. Now, that is a point that was made a great number of years ago—several years ago—by the naval party who are always moving and bringing forward various topics to turn public attention to the navy in order to get a larger sum annually for expenditure upon it.

Perhaps that is a very righteous idea; it is a very righteous object. But I believe myself that the proposition that was put forward, and which has been referred to by the lecturer to-day, viz, that if we lost command of the sea we should be starved in England, is entirely erroneous. It is a point that has been very carefully gone into, first of all by statisticians, who have proved, I think, that during four months in each year we have got eight months' supply of provisions always on hand, and that the lowest quantity we ever fall to is four months' supply, and that only for two months in the year. Then, even apart from that fact, we could not be starved out for a considerable number of months. I believe myself that the recent experience we have gone through during our naval maneuvers has proved that an efficient blockade of our coasts so as to cut us off either from Russia or America would be absolutely impossible. During several of these naval operations to which I have referred, the navy endeavored to blockade one port, and this proved to be unsuccessful. The ships have gone in at night, and gone out at night; and I do not believe for one moment that if to-morrow we were at war with a continental power it would be able to

drive our navy off the sea. I believe you could get clever and able men, who man and command ships in America, to bring in food supplies to our ports—to several ports in the United Kingdom of Great Britain and Ireland that could not be blockaded. That is the only point that has been brought forward by the lecturer to which I will take exception. With the main lines upon which he has argued I entirely agree. My views are with his. He has referred to a school which is of recent creation in England, and the officers who have spoken have also done so. This new school says that we in England really only require a strong navy for the protection not only of our own country from invasion, but also for the protection of our wide and extending Empire all over the world. I believe that to be not only a very foolish idea, but I believe it to be a dangerous one. I entirely believe what the lecturer has told us, that if we wish to be a strong power we must have a strong second line. And I think that in these days, with the experience we have had of the number of accidents that occur to the fleets, and so on, I think to depend entirely for the defense of England on the first line—that is, upon our ships of war—would be a foolish and suicidal policy. I think that the old impression of having two strings to your bow is an absolutely true one when it is applied to the defense of a country; and to depend upon such a fickle thing as the sea entirely for your defense of England is a very unwise thing indeed.

I am very glad to see that the recent operations which have been taking place in the Gulf of Pechili and the Yellow Sea, between the Japanese and the Chinese, will go a very great way to give us most satisfactory information and teach us the most useful lessons upon this very important subject. Now, what was the condition of things that existed before the Japanese declared war with China? It is a curious thing to study this point, and it is one that I do not think has hitherto been brought before the people of England as it ought to be. Before war was declared China possessed, and was recognized as possessing, a finer fleet than the fleet of Japan. There were many reasons; there were many causes for this fact. First of all, the Chinese from time immemorial had been very fine sailors. Even as long ago as 1860, when we had war there, it was a curious thing to see then how the Chinese shores were guarded by junks, frail looking affairs according to our notions; and to see these often beating against a very strong wind, and holding their own in the way they did, was a curious thing. Well, as I have said, from time immemorial the Chinese have been celebrated as good shipbuilders and the very best seamen. Now, what, on the other hand, do we find in Japan? In the same period to which I refer I had the advantage of visiting Japan, and I found that the laws existing there in those days, before the great revolution which civilized Japan took place, the laws prevented the Japanese from building ships of a nature that could go to sea at all. They were compelled to build their junks with open sterns; and it was a decidedly accepted policy on the part of the rulers of Japan that they would not allow their people to communicate with foreign countries, and in order to prevent them from doing so they would not allow them to build vessels to go across that short distance that divided them from Korea. And therefore it is that the Japanese have always been poor sailors.

Now, that was the condition of things. The Chinese had the superiority of a fleet. Their fleet was more numerous than the Japanese fleet. They had a larger tonnage, and some of their vessels were finer men-of-war than nowadays possessed by Japan. They were manned by a race that I certainly believe that any one who knows anything about them will say is certainly not inferior to the Japanese in any way whatever, but indubitably they were better and had been better sailors from time immemorial than the Japanese. The Japanese, however, have created a fleet in modern times, since that revolution to which I have referred. That fleet was designed by men who have been largely educated in our own fleet and who knew a great deal about the work they had to do. The sailors were the ordinary Japanese boatmen that you will find in the seaports that line their coasts. Well, the Japanese were a very wise people. For years and years past they have been preparing for this war. They recognized the fact, I suppose, that although not superior in numbers, they might be superior in organization. They were wise enough to provide themselves

with a second line, and they went in not only for the construction of an efficient fleet, but also for the construction of an efficient army, whereas China depended entirely for its defense upon its navy. It absolutely disregarded its army. The army of China when this war broke out was a farce. It was absolutely a collection of men, many of them still carrying flags and umbrellas to protect them from the sun. But they had no organization as an army; they were incapable of moving as an army, and they did not know the first rudiments of military art.

I shall not go into any detailed account of the reasons for this. I could not do so, because anyone who knows China knows that the soldier's profession is despised there, and until that idea is got rid of you can never have an army in China. I merely refer to the broad fact that at the beginning of this war China possessed a stronger fleet than Japan, but she had no army, practically. Japan, on the other hand, although not having a better fleet than China, had a most powerful army. What has been the result? I can not help thinking * * * that on many occasions during the last three or four months China has woefully rued the fact that she concurred in the representations that have been put forward by that school to which reference has been made to-day—that school which would have us to believe that we ought to depend entirely and exclusively upon the first line of defense—our navy. There is no one in England or this country who is more anxious to see our navy supreme upon the sea than I am. There is no one who to-morrow would vote more money from Parliament, if I had the power to vote, for the maintenance of our navy than I would. I do not think our navy is as strong as it ought to be. I have said so on many and many an occasion in private, and also in public; and I believe that a considerable addition to our navy is indispensable if we are to hold the same great position that we held before; but at the same time, I believe that the school that would impress upon the people of England that, while it is necessary to do that which we recognize as absolutely necessary, it is unnecessary to have an army either for offensive of defensive purposes is not only an unwise one, but is a wicked one. These are the remarks I intended to make. I think if we should come to war you would realize the truth of the conclusions that have been arrived at by the very able arguments adduced by the lecturer in the course of the lecture which he has been good enough to deliver before us. * * *

THE INVASION OF ENGLAND.

[From the United Service Magazine, February, 1896.]

It is always of interest and service to see ourselves as others see us, and just now it may be useful to take into account military opinion in Germany on our position.

In the Militaer-Wochenblatt of the 15th and 18th of January, Baron von Lüttwitz, an officer of the German staff, examines the question of the possibility of an invasion of England by the light of the experiences of history, prefacing his essay with the remark that though Great Britain still holds by far the greatest number of colonial possessions, yet in various quarters of the globe the interests of other nations are beginning to assert themselves. He thinks there will be a great struggle for supremacy in Asia at no distant day, but that the decisive battle for this must be fought out in Europe, and he expresses surprise that, while all the other great Powers of Europe have perfected their organization and stand armed to the teeth and equipped for war as never before, England alone should abstain from this necessity of the times. In politics, after all, might is right, and he who has great possessions must be strong enough to defend them. He scoffs at our system of recruiting, saying it remains where it was in the time of Wellington and the American war of independence, with its soldiers of the line, militia, and volunteers all voluntarily enlisted. Such a system is only sufficient for wars with uncivilized nations. Great Britain will not interfere directly in a continental war, while from invasion she thinks herself safe. She rests her belief in this on the bare fact that since the conquest no invasion has succeeded, and that her

naval supremacy frees her from the necessity of having her land forces in a state of more complete preparation.

Since Elizabeth's time England has, on the whole, enjoyed this naval supremacy, but in 1667 she was reduced to a second-rate sea power, and the Dutch, under de Ruyter, boldly sailed up the Thames and burned English vessels after defeating her fleet.

In 1797 England could only place thirty-six vessels in line to oppose the French and Spaniards. Even if England is now superior to any one naval power, she would not, he thinks, be superior to the combined fleets of France and Russia. But the chief factor in any future war is what nation has the greatest sea power on the decisive field of battle—the English Channel. The French channel fleet is even now on a par with that of England. If the Russian fleet joined it, and possibly a portion of the German fleet (and the facilities for the combination of these offered by the Emperor William Canal must be taken into consideration), the preponderance of England in the channel would be very problematical. Judging by the recent exertions, England has probably foreseen this herself. If we examine, he says, the much-vaunted British constitution, here again history declares many chinks in her armor. Since Cromwell's time Ireland groans in her fetters. Every military disaster that England has suffered has evoked rebellion in Ireland. Every invader has found, and will find, an ally in her. It took 30,000 men and immense exertions to put down the rebellion of 1798. For all this the Briton boasts, and that with right, that never yet has an invader of his island succeeded.

Now, this is a remarkable fact, the writer continues, considering we have in all periods of history beheld British armies fighting on the Continent. They took part in nearly all the battles fought against Louis XIV, against Frederick, and against Napoleon.

Is, then, an invasion of Great Britain, from a military point of view, something totally different and much more difficult than a British invasion of the continent of Europe? Must all attempts at an invasion of England fail because there is something impossible in the undertaking? asks the writer, who then proceeds to make what he calls a critical examination of the various attempts that have taken place.

He attributes the failure of the Spanish armada, in 1588, to defects in plan and defects in organization, and considers—

1. A mistake was made in mixing the invading army with the sea-fighting fleet. The latter should have been kept quite separate from, and unencumbered by, the invading troops, so as to be free to act against the English fleet. The former should have been embarked in transports protected by fighting vessels, which the Spaniards with their numerous fleet could well have spared.

2. Ignorance on the part of the Spaniards of the English Channel; five-sixth of their vessels had so heavy a draft that landing troops from them was only possible in well-defended harbors.

3. Ignorance of the sudden changes of weather to which then, as now, the channel was liable. The close order observed by the fleet was, therefore, in the absence of trustworthy pilots, doubly dangerous.

4. Small scouting vessels of light draft seem to have been entirely wanting.

5. That the leader was quite unacquainted with naval matters.

6. That a landing was to be attempted before the English fleet was defeated.

In 1690, Louis XIV sent James II with 10,000 men to invade Ireland, but he was defeated at the Boyne on the 13th July by William III, and in 1691 the remnant of the invading army surrendered. Louis made the mistake of aiming the blow at one of the limbs instead of at England, the vital center. On the 18th July, 1690, De Tourville defeated the combined Anglo-Dutch fleet, so that the waters of the English Channel may have been described as French waters. The friends of James II besought Louis XIV to seize the opportunity; but he would not, though everything was in favor of the invaders, as the French were supreme at sea, and William III was engaged in suppressing rebellion.

The projected invasion of the Old Pretender in 1708 was undertaken with too small a force, and at the wrong point. No landing was attempted, the appearance of Admiral Byng, with the English fleet having sufficed to send the French squadron of thirty-two vessels back to France.

Next comes the plan of invasion projected by Napoleon in 1805, which will assuredly form the ground work of any future plan for the invasion of England. England's strength lay on the sea in her fleet; France's on land in her army. How was the struggle to be carried on? Obviously a naval war must be changed into operations by land, if France was to use her strength to the best advantage.

There were two ways of carrying into practice this theory—the indirect and the direct; the first led to military occupation of the countries of England's allies; the latter to the invasion of her colonies, of Ireland, or of England—London being the objective in the latter case.

The first plan had been steadily followed by Napoleon, 1800 to 1812, by the occupation of Vienna, Berlin, Madrid, Moscow; and what did it lead to? St. Helena!

In like manner, an invasion of Ireland would be but to grapple with a side issue, avoiding the main point, and so fail of permanent effect. Certainly, had he decided to act simply on the defensive against England, he could have operated effectively in Ireland on the offensive. Thirty or forty thousand men under a general of the caliber of Masséna, thrown into Ireland, would soon have put an end to British subsidies to the allies.

The Directory had held this view, and on the 15th of December, 1796, had embarked at Brest General Hoche, fresh from the pacification of La Vendée, on seventeen ships of the line and thirteen frigates, a force destined for the occupation of Ireland. At the landing in Bantry Bay a storm threw the French ships in confusion, carrying the flag-ship, with Hoche on board, back to La Rochelle. Thereon the expedition was regarded as a failure. The attempt was to be renewed in the autumn of 1797. But the Dutch fleet, which was to have transported the invading army, was so badly beaten by Admiral Duncan at Camperdown that it quickly sought a refuge on its own shores.

It is possible that these failures set Napoleon against any attempts to invade Ireland. He saw that the only infallible way to destroy England's power was by the invasion of England. England had been isolated by the treaty of Lunéville. The first consul at once ordered the assembly of 100,000 men, and the construction of a flotilla of small vessels of light draft at Boulogne. Then came the peace of Amiens. On the 13th May, 1803, however, the war broke out afresh. Public opinion, more than his own inclination for the task, now drove Napoleon to take decided measures toward the invasion of England, which had become a rooted idea in France. His preparations were postponed till, in 1805, they were near realization. They were twofold in character—military and political. The first to secure success, and the second to secure abstention from foreign interference.

Now, what did Napoleon in 1805? What do we, at the present time, understand by the success of an invasion of England? A lasting conquest like that of William of Normandy? Certainly not!

Success would consist in—

1. The transport and landing of an invading army.

2. The destruction of the British forces.

3. The occupation of the capital as center of the material as well as the intellectual wealth of the country.

4. A quickly concluded peace, under such conditions as would make it impossible for England to resume the war for a long time.

There was but one way for England to render this success impossible—by annihilating the invading army during the passage or in the attempted landing of the force. The first steps taken must be to blockade the French and Dutch harbors, to render impossible the preparations for the passage of the channel, or at least to hinder them as much as possible.

How well the English admirals of 1588 had understood this.

In 1805 they failed in doing so owing to the excellent arrangements made by Napoleon for the protection of the harbors—over 600 heavy guns had been mounted on shore batteries along the French coast. The organization of the fleet of transports progressed unremittingly.

The leading principle was kept in view of having the fleet kept for fighting and the invading force to have its own transport.

One thousand two hundred and forty gun sloops, gunboats, etc., and 625 transports to follow his second line, were ready in Vimereux, Ambleteuse, Boulogne, and Étables.

By means of these, 100,000 men could be thrown on the coast of England at one crossing.

The troop boats were specially designed for their transport, being capable of being rowed or sailed, while they only drew 6 or 7 feet of water, and were keelless, to enable a landing to be effected even at ebb tide.

Each gun sloop carried one company and four heavy ship's guns; the gunboats one company, one ship's gun, and one field gun, for which two horses were carried amidships.

It was reckoned by the most eminent seamen in France that forty-eight hours would have sufficed with such preparations to embark and pass over 132,000 men and 400 guns, and that the train with 1,000 horses could follow within a week, during which time it would, of course, be necessary for Napoleon to remain master of the Channel. But since the battle of the Nile the French fleet had been in every way inferior to the British. Only by sacrificing a portion for the benefit ot the whole, therefore, could success be hoped for. The author then contrasts the two fleets of the present day with those of 1804. In the mouth of the Thames there were then 12 ships of the line to watch the Dutch fleet in Texel, 7 or 8 ships of the line at Spithead, with a number of frigates, brigs, and gunboats, some not equipped. Both squadrons were inferior to the Dutch fleet. Lord Cornwallis blockaded Brest with 19 ships of the line, 21 French ships of the line were lying there under Vice-Admiral Ganteaume. If the British squadron had timely notice of the passage it could return within four to six days to Dover, followed, of course, by the French, who would attack them. The rest of the British fleet was in pursuit of the French Admiral Villeneuve, who had left the West Indies with 21 ships of the line bound for Ferrol. He had orders to raise the blockade of Ferrol or Brest, uniting with the French squadrons, then to return to cover the passage of the army invading England.

"This is an unaccountable order," says the writer; "the very contrary should have been done." He would, had he obeyed it, have been followed by the British fleet. Now, this should, by every means, have been lured away from the Channel, and the Channel fleet attacked by the French home fleets.

However, Napoleon was, he says, by this time no longer in keen earnest about the invasion. The fact remains that the largest portion of the English fleet was 187 miles west of Ferrol, and that Nelson was off Gibraltar; therefore these squadrons could not have returned to the Channel in less than a fortnight; while the French Channel fleet could have engaged and held in check that of the British there, so that in the middle of July the invasion was possible. The British militia and volunteers of that day, with their antiquated organization, could hardly have resisted Napoleon's great military genius and his experienced soldiers imbued with the spirit of self-confidence and led by young but practiced generals eager for glory. The way in which the English scattered their troops all along the coast, against all the rules of war, says little for their capacity. States which, like England, depend on volunteer forces, will have a rude awakening when opposed to regular troops.

The French troops were distributed as follows:

Vimereux (Lannes)	14,000
Ambleteuse (Davout)	26,000
Boulogne (Soult and the Emperor)	40,000
Étable (Ney)	22,000
Texel (Marmont)	25,000
In reserve	27,000
Total	154,000

These once landed could be brought under one command in one day, and within four days be in London. This, unprovided with defenses, would fall at once. The possession of the capital would not have meant the possession of the arsenals and dockyards, but a heavy fine would have been exacted from the wealthy inhabitants. No one knew this better than Napoleon. Had France then had peace on her own frontiers, there is little doubt of the success of the invasion of England. Revolution in Ireland would have cooperated with the invader, and Napoleon fully believed in the possibility of success, and only renounced the expedition because he foresaw greater certainty and more important results from a continental war with Austria.

"An invasion of England would be risky—not impossible." Quoting from Von Wartenburg, he adds that many events pronounced by contemporaries impossibilities have yet been carried out by commanding genius. If this study—says the author, in conclusion—should have succeeded in destroying the illusion of the unassailability of Great Britain, it will have fulfilled its object.

Since 1805 the introduction of steam and the electric telegraph have increased the favorable chances of an attack on England, the assembly and quick transport of an invading army being thereby much facilitated. In these days especially should this factor be borne in mind.

We will not venture to follow the writer in his curious readings of English history, nor do we quite see how the French Channel fleet was to have attacked and held the English Channel fleet, seeing it was blockaded by Lord Cornwallis so closely, says Captain Mahan, "that it excited not only the admiration but the wonder of contemporaries." And it is hardly to be supposed that our navy would be taken unawares now, as it was in Louis XIV's time, when it was "paralyzed by the corruption which prevailed in the public service," as one historian puts it. But those who look upon an invasion as impossible should remember that but for Nelson and the admirable handling of the British navy it would not have been so in 1805.

Since then other navies have also made great progress; and as the views of this German officer certainly prevail to a great extent on the Continent, it would be well to consider what might happen to England in the event of a coalition of two or three naval powers against us, compelling us to unduly scatter our fleet. To avoid this, it is necessary not only to maintain our naval supremacy all over the world but to exert ourselves unremittingly to raise our home defense force to a high state of completeness and efficiency in men and material, so that in the event of our ships being lured away or overpowered, our field army, aided by a well-thought-out system of field defenses, may, on every possible line of advance of an invader, hold its own.

Extracts from "How Canada is Governed."

By J. G. BOURINOT, C. M. G., LL. D., D. C. L., D. L.

THE PRIVY COUNCIL OF CANADA.

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The minister of militia and defense is responsible for the administration of the militia affairs, including fortifications, armories, munitions of war, stores, schools of instruction, militia college at Kingston. Under him is a major-general, chosen from the regular military service of England.

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The minister of the interior has control and management of the affairs of the Northwest Territories, of the Indians, and of all public lands belonging to the Government, and of the geological survey of Canada.

MILITIA AND DEFENSE.

The British North America act places under the control of the Dominion Government the militia, naval service, and defense of Canada. The command-in-chief of the land and naval forces of and in Canada, however, continues to be vested in the Queen. A department of the Dominion Government, called the department of militia and defense (see above), has the superintendence of this important part of the public service. Since confederation, English troops have been removed from all places in Canada except Halifax, which is a strongly fortified military post and the headquarters of the North American squadron, under the command of a vice or rear admiral. On the Pacific side Esquimalt, on the Island of Vancouver, is also being fortified, and will be garrisoned by imperial troops.

The withdrawal of English troops to so great an extent from Canada has necessarily thrown large responsibilities upon the Canadian Government since 1867 for the protection of a confederation extending over so immense a territory between two oceans. Canada has attempted to fulfill her obligations in this respect by the expenditure of a large sum of money during twenty-seven years for the drill, instruction, and arming of an effective militia drawn from the great body of the people. In this way a spirit of self-reliance has been stimulated from one end of Canada to the other, and on more than one emergency the national forces have proved their capacity to secure peace and order and put down rebellion.

By the law of Canada the militia consists of all the male inhabitants of Canada of the age of 18 years or upward and under 60, not exempted or disqualified by law; the population being divided into four classes, as follows:

The first class comprises those aged 18 or upward and under 30, being unmarried or widowers without children.

The second class comprises those between the ages of 30 and 45, being unmarried or widowers without children.

The third class comprises those between 18 and 45, being married or widowers with children.

The fourth class comprises those between 45 and 60.

And those liable to serve shall be called upon in the foregoing order.

The following persons are exempt from enrollment and actual service at any time: Judges, clergymen, and ministers of all religious denominations, professors in colleges and teachers in religious orders, persons engaged in the collection or management of the revenue, the wardens and officials of all penitentiaries and lunatic asylums, persons physically disabled, and any person being the only son of a widow and her only support. Half pay and retired officers of the imperial forces, sailors actually employed in their calling, pilots during the season of navigation, and masters of schools are exempt from service, except in case of war. Quakers, Mennonites, and others may be exempted altogether under regulations prescribed by the governor-general in council.

The militia is divided into active and reserve land and marine forces. The land force is composed of corps raised either by voluntary enlistment or ballot. The active marine force shall be raised in the same way, and composed of seamen, sailors, and persons whose occupation is on vessels navigating the waters of Canada; and the reserve force, land and marine, consists of the whole of the men not serving in the active militia for the time being.

The period of service in the militia is three years. The number of men to be trained and drilled annually is limited to 45,000, except as specially authorized, and the period of drill is to be sixteen days, and not less than eight days each year.

The Dominion is divided into twelve military districts, in each of which a permanent military staff is maintained, under command of a deputy adjutant-general. The permanent corps and schools of instruction consist of royal Canadian dragoons, royal Canadian artillery, garrison artillery, and a royal regiment of Canadian infantry. The total strength of these permanent corps is limited by the militia law to a thousand men.

The royal military college at Kingston, which is under the control of the militia department, was founded in 1875, and has proved on the whole a most successful institution. Of the total number of cadets who have graduated, a large number have been gazetted to commissions in the imperial army. Four commissions are annually offered by the Imperial Government, and in 1888 six others were offered.

Heretofore an imperial officer has been chosen from the regular English military force and given the rank of a major-general in Canada, to command the militia and supervise their instruction and equipment, under the control of the minister of militia, who is responsible to Parliament for the efficiency of this department. So far no active marine militia has been organized in the Dominion, but the naval defenses continue exclusively under the care of the Imperial Government. In the Northwest Territories peace and order have been secured for years by the employment of a most efficient body of mounted police.

THE INDIANS.

By the British North America act the Dominion Government has sole control over the Indians, and lands reserved for Indians, in the provinces and territories of the Dominion. One of the departments of the Government of Canada is that of Indian affairs, of which a superintendent-general is the head. It has the management and charge of all matters relating to the Indians. The minister of the interior (see above) generally fills the position of superintendent-general, and has the assistance of a number of officers to manage the business of the department. In all the provinces and territories there are bands or remnants of the old tribes or "nations" that once inhabited British North America, who live on lands specially reserved for their use and benefit. The law carefully guards their interests, and all property held for them can only be alienated or

leased by their own consent, and then the proceeds are invested for their sole advantage. The law makes very satisfactory provision for the "enfranchisement" of the Indians—that is, the conferring upon them the rights and privileges of free citizens whenever they come up to the qualifications laid down to meet their case.

Indians in the old provinces can vote at dominion and provincial elections, on the conditions laid down in the statutes on the subject, but in the territories and Manitoba they have not yet reached that degree of civilization which would enable them to exercise the rights of white men. There are in British Columbia and the organized territories some 46,000 Indians, in various stages of development. They are the wards of the Canadian Government, which has always exercised a parental care over them. They are fed and clothed in large numbers. Before lands were laid out for settlement the Indian titles were extinguished by treaties of purchase, conducted between the representative of the dominion and the councils of the several tribes. The Indians live on "reserves" set apart for them in valuable districts; industrial farms and other schools are provided by the Government with the creditable hope of making them more useful members of the community. Agents live on the reserves, and inspectors visit the agencies from time to time to see that the interests of the Indians are protected in accordance with the general policy of the Government. The sale of spirituous liquors is expressly forbidden to the Indian population, and severe punishment is provided by the law for those who evade this wise regulation.

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